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Draft Environmental Impact Statement

for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts

of Salem, Eugene, Roseburg, Coos Bay, and Medford Districts, and the Klamath Falls Resource Area of the Lakeview District

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WESTERN OREGON PLAN REVISIONS

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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Appendix A. Legal Authorities

This appendix provides the background on the legal authorities and major court rulings that are related to this draft environmental impact statement.

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Settlement Agreement

In 1997, timber industry groups, county governments, and others filed a lawsuit (*AFRC v. Clarke*, Civil No. 94-1031-TPJ (D.D.C.)) in the United States District Court for the District of Columbia (D.C. District Court). This lawsuit alleged that the O&C Act had not been appropriately considered in applying the Northwest Forest Plan's management direction to the O&C lands. The allegation was that the Northwest Forest Plan's system of large reserves and its standards and guidelines, which restrict timber harvesting for the purpose of achieving conservation principles, differs from the ruling of the United States Court of Appeals for the Ninth Circuit (Ninth Circuit Court) regarding the statutory direction for managing the O&C lands. The ruling from the Ninth Circuit Court (*Headwaters, Inc. v. BLM*, 914 F.2d 1174, 1183 (9th Cir., 1990)) stated that "exempting certain timber resources from harvesting to serve as wildlife habitat … is inconsistent with the principles of sustained yield". The *AFRC v. Clarke* lawsuit also alleged that the specific contribution of the BLM lands to the overall conservation strategy of the Northwest Forest Plan was not sufficiently analyzed in the Northwest Forest Plan's supplemental environmental impact statement to determine whether the extensive reservation of the O&C lands from timber harvesting in the Northwest Forest Plan was required in order to comply with the Endangered Species Act.

To resolve the lawsuit, the Secretary of Interior, the American Forest Resource Council, and the Association of O&C Counties entered into a settlement agreement that was approved by the United States District Court for the District of Columbia (D.C. District Court) on August 28, 2003. At the time of the settlement, the case was pending review in the United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit Court) for the D.C. District Court's dismissal of the case as *res judicata*. Under the settlement agreement, the BLM agreed to revise its resource management plans in western Oregon and in that revision the BLM would consider an alternative that would not create any reserves on the O&C lands, except those reserves required to avoid jeopardy to species listed as threatened or endangered under the Endangered Species Act. The BLM also agreed that all resource management plan revisions shall be consistent with the O&C Act as interpreted by the Ninth Circuit Court.

Res judicata

A rule of civil law that says an issue cannot be relitigated after a final judgment has been rendered.

Major Court Rulings

The following are descriptions of the court rulings that are the most relevant to the decisions that must be made in revising the resource management plans for the BLM lands in western Oregon.

Headwaters, Inc. v. BLM, 914 F.2d 1174 (9th Cir. 1990)

In a 1990 lawsuit by Headwaters, Inc., the plaintiffs argued that the O&C Act requires the BLM to manage the O&C lands for multiple uses, including wildlife conservation, rather than for the dominant use of timber production. There were several issues in this case, including compliance with the National Environmental Policy Act. The issue most relevant to this revision of the resource management plans, however, is the interpretation of the O&C Act's reference to forest production.

In ruling on this case, the United States Court of Appeals for the Ninth Circuit (Ninth Circuit Court) stated that "the primary purpose of the O&C Act lands is for timber production in conformity with the provision of sustained yield." Even more explicitly, the Ninth Circuit Court held that "exempting certain timber resources from harvesting to serve as wildlife habitat is inconsistent with the principle of sustained yield." The court also stated that "[i]t is entirely consistent with these goals to conclude that the O&C Act envisions timber production as a dominant use." The court further stated that "[t]he purposes of the O&C Act were twofold. First, the O&C Act was intended to provide the counties … with [a] stream of revenue … Second, the O&C Act was intended to halt previous practices of clear-cutting without reforestation" (*Headwaters, Inc. v. BLM*, 914 F.2d 1174 (9th Cir. 1990)). Citing the legislative history of the O&C Act, the Ninth Circuit Court explained that "[t]his type of [sustained-yield] management will make for a more permanent type of community, contribute to the local dependent industries, protect watersheds, and aid in regulating streamflow." In other words, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries were expected outcomes of managing these lands under the principles of sustained-yield management. The Ninth Circuit Court found nothing in the legislative history to "suggest that wildlife habitat conservation or conservation of old growth forest is a goal on a par with timber production, or indeed that it is a goal of the O&C Act at all" *Headwaters, Inc. v. BLM,* 914 F.2d 1183-84 (9th Cir. 1990).

This opinion was not the first to rule on the management of the BLM lands under the O&C Act, however, it is the most explicit. It followed previous rulings of the Ninth Circuit Court on the purposes of the O&C Act, specifically: *O'Neal v. United States*, 814 F.2d 1285, 1287 (9th Cir. 1987); and *Skoko v. Andrus*, 638 F.2d 1154, 1156 (9th Cir.), *cert. denied*, 444 U.S. 927, 62 L. Ed. 2d 183, 100 S. Ct. 266 (1979).

Portland Audubon Society v. Babbitt, 998 F.2d 705 (9th Cir. 1993)

In this case, environmental groups challenged a decision made by the BLM to not supplement timber management plans with new information concerning the plan's effect on the northern spotted owl and asked the court to issue an injunction against logging operations in BLM forests that contained northern spotted owl habitat until a supplemental environmental impact statement was prepared. The BLM argued that the holding of the Ninth Circuit Court in *Headwaters, Inc. v. BLM*, 914 F.2d 1174, 1178-80 (9th Cir. 1990), *reh'g denied*, 940 F.2d 435 (1991), supports the conclusion that the BLM's decision not to supplement the environmental impact statements was reasonable, that the O&C Act requires the BLM to sell 500 million board feet of timber per year, and that relief provided by the court must not conflict with this congressional direction. The court, however, found that the National Environmental Policy Act (passed after the O&C Act) does apply to all government actions having significant environmental impact, even though the actions may be authorized by other legislation. The court also found that the O&C Act did not establish a minimum volume that must be offered every year notwithstanding any other law. Therefore, compliance with the National Environmental Policy Act, or enjoining timber harvests until the BLM complies with the National Environmental Policy Act, is not inconsistent with either the volume requirements of the O&C Act or the management of the lands entrusted to its care.

Seattle Audubon Society v. Lyons, 871 F. Supp. 1291, 1314 (W.D. Wash., 1994)

This case was a challenge to the Northwest Forest Plan and was filed soon after the filing of *AFRC v. Clarke*.[1] In the challenge of the Northwest Forest Plan in the United States District Court for the Western District of Washington (Western Washington District Court), the court found that the management decision made about the O&C lands was a lawful exercise of the discretion of the Secretary of the Interior under the O&C Act because of the broad mandate to manage federal lands to conserve habitat for species listed for protection under the Endangered Species Act. The Western Washington District Court, however, did not identify the Northwest Forest Plan as the *only* decision that would meet the requirements of the Endangered Species Act (*Seattle Audubon Society v. Lyons*, 871 F. Supp. 1291, 1313-1314 (W.D. Wash., 1994)).

[1] *AFRC v. Clarke*, Civil No. 94-1031-TPJ (D.D.C.)

Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service, 378 F.3d 1059 (9th Cir. 2004)

In this case, the Ninth Circuit Court[2] rejected the regulatory definition of "destruction or adverse modification of critical habitat" and directed consulting agencies to consider the effects of an action on the critical habitat network without reference to other conservation programs, such as the late-successional reserves in the Northwest Forest Plan. The court stated that critical habitat must provide for both the survival and the recovery of a listed species and that the analysis of whether there is adverse modification always requires consideration of the impacts on the recovery of a species. This case highlighted the issue that resulted from the difference in the Northwest Forest Plan's late-successional reserves and the designated critical habitat for the northern spotted owl.

[2] United States Court of Appeals for the Ninth Circuit (Ninth Circuit Court)

Major Legal Authorities

The following is a list of the major legal authorities that are relevant to the BLM land use planning process. It is not an inclusive list.

- The Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (O&C Act) (43 U.S.C. §1181a, *et seq.*) provides the legal authority for the management of O&C lands by the Secretary of the Interior. The O&C Act requires that the O&C lands be managed "for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities" (43 U.S.C. §1181a)
- The Federal Land Policy and Management Act of 1976 (FLPMA), as amended, 43 U.S.C. 1701 *et seq.*, provides the authority for the BLM land use planning.
  - Sec. 102 (a) (7) and (8) sets forth the policy of the United States concerning the management of the public lands.
  - Sec. 201 requires the Secretary of the Interior to prepare and maintain an inventory of the public lands and their resource and other values, giving priority to areas of critical environmental concern (ACECs), and, as funding and workforce are available, to determine the boundaries of the public lands, provide signs and maps to the public, and provide inventory data to State and local governments.
  - Sec. 202 (a) requires the Secretary, with public involvement, to develop, maintain, and when appropriate, revise land use plans that provide by tracts or areas for the use of the public lands.
  - Sec. 202(c)(1-9) requires that, in developing land use plans, the BLM shall use and observe the principles of multiple use and sustained yield; use a systematic interdisciplinary approach; give priority to the designation and protection of areas of critical environmental concern; rely, to the extent it is available, on the inventory of the public lands; consider present and potential uses of the public lands; consider the relative scarcity of the values involved and the availability of alternative means and sites for realizing those values; weigh long-term benefits to the public against short term benefits; provide for compliance with applicable pollution control laws, including State and Federal air, water, noise, or other pollution standards or implementation plans; and consider the policies of approved State and tribal land resource management programs, developing land use plans that are consistent with State and local plans to the maximum extent possible consistent with Federal law and the purposes of this Act.

  - Sec. 202 (d) provides that all public lands, regardless of classification, are subject to inclusion in land use plans, and that the Secretary may modify or terminate classifications consistent with land use plans.
  - Sec. 202 (f) and Sec. 309 (e) provide that Federal, State, and local governments and the public be given adequate notice and an opportunity to comment on the formulation of standards and criteria for, and to participate in, the preparation and execution of plans and programs for the management of the public lands.
  - Sec. 302 (a) requires the Secretary to manage BLM lands under the principles of multiple use and sustained yield, in accordance with available land use plans developed under Sec. 202 of FLPMA. There is one exception: where a tract of the BLM lands has been dedicated to specific uses according to other provisions of law, it shall be managed in accordance with such laws.
  - Sec. 302 (b) recognizes the entry and development rights of mining claimants, while directing the Secretary to prevent unnecessary or undue degradation of the public lands.

- The National Environmental Policy Act of 1969 (NEPA), as amended, 42 U.S.C. 4321 *et seq.*, requires the consideration and public availability of information regarding the environmental impacts of major Federal actions significantly affecting the quality of the human environment. This includes the consideration of alternatives and mitigation of impacts.
- The Clean Air Act of 1990, as amended, 42 U.S.C. 7418, requires Federal agencies to comply with all Federal, State and local requirements regarding the control and abatement of air pollution. This includes abiding by the requirements of State Implementation Plans.
- The Clean Water Act of 1987, as amended, 33 U.S.C. 1251, establishes objectives to restore and maintain the chemical, physical, and biological integrity of the Nation's water.
- The Federal Water Pollution Control Act, 33 U.S.C. 1323, requires Federal land managers to comply with all Federal, State, and local requirements, administrative authorities, process, and sanctions regarding the control and abatement of water pollution in the same manner and to the same extent as any nongovernmental entity.
- The Safe Drinking Water Act, 42 U.S.C. 201, is designed to make the Nation's waters "drinkable" as well as "swimmable." Amendments in 1996 establish a direct connection between safe drinking water and watershed protection and management.
- The Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. 1531 *et seq.*:
  - Provides a means whereby the ecosystems upon which endangered and threatened species depend may be conserved and provides a program for the conservation of such endangered and threatened species (Sec. 1531 (b), Purposes).
  - Requires all Federal agencies to seek to conserve endangered and threatened species and utilize applicable authorities in furtherance of the purposes of the Endangered Species Act (Sec. 1531 (c) (1), Policy).



  - Requires all Federal agencies to avoid jeopardizing the continued existence of any species that is listed or proposed for listing as threatened or endangered or destroying or adversely modifying its designated or proposed critical habitat (Sec. 1536 (a), Interagency Cooperation).
  - Requires all Federal agencies to consult (or confer) in accordance with Sec. 7 of the ESA with the Secretary of the Interior, through the Fish and Wildlife Service and/or the National Marine Fisheries Service, to ensure that any Federal action (including land use plans) or activity is not likely to jeopardize the continued existence of any species listed or proposed to be listed under the provisions of the ESA, or result in the destruction or adverse modification of designated or proposed critical habitat (Sec. 1536 (a), Interagency Cooperation, and 50 CFR 402).

- The Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 *et seq.*, requires Federal land management agencies to identify potential river systems and then study them for potential designation as wild, scenic, or recreational rivers.
- The Wilderness Act, as amended, 16 U.S.C. 1131 *et seq.*, authorizes the President to make recommendations to the Congress for Federal lands to be set aside for preservation as wilderness.
- The Antiquities Act of 1906, 16 U.S.C. 431-433, protects cultural resources on Federal lands and authorizes the President to designate National Monuments on Federal lands.
- The National Historic Preservation Act (NHPA), as amended, 16 U.S.C. 470, expands protection of historic and archaeological properties to include those of national, State, and local significance and directs Federal agencies to consider the effects of proposed actions on properties eligible for or included in the National Register of Historic Places. It also directs the pro-active management of historic resources.
- The American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996, establishes a national policy to protect and preserve the right of American Indians to exercise traditional Indian religious beliefs or practices.
- The Recreation and Public Purposes Act of 1926, as amended, 43 U.S.C. 869 *et seq.*, authorizes the Secretary of the Interior to lease or convey BLM lands for recreational and public purposes under specified conditions.
- The Federal Coal Leasing Amendments Act of 1976, 30 U.S.C. 201 (a) (3) (A) (i), requires that coal leases be issued in conformance with a comprehensive land use plan.
- The Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. 1201 *et seq.*, requires application of unsuitability criteria prior to coal leasing and also to proposed mining operations for minerals or mineral materials other than coal.
- The Mineral Leasing Act of 1920, as amended, 30 U.S.C. 181 *et seq.,* authorizes the development and conservation of oil and gas resources.
- The Onshore Oil and Gas Leasing Reform Act of 1987, 30 U.S.C. 181 *et seq.*, provides that a study be conducted by the National Academy of Sciences and the Comptroller General that results in recommendations for improvements which may be necessary to

ensure the following are adequately addressed in Federal land use plans:

  - Potential oil and gas resources are identified;
  - The social, economic, and environmental consequences of exploration for and development of oil and gas resources are determined; and
  - Any stipulations to be applied to oil and gas leases are clearly identified.

- The General Mining Law of 1872, as amended, 30 U.S.C. 21 *et seq.*, allows the location, use, and patenting of mining claims on sites on public domain lands of the United States.
- The Mining and Mineral Policy Act of 1970, 30 U.S.C. 21a, establishes a policy of fostering the orderly development of economically stable mining and minerals industries and studying methods for reclamation and the disposal of waste.
- The Taylor Grazing Act of 1934, 43 U.S.C. 315, authorizes the Secretary of the Interior "to establish grazing districts, or additions thereto and/or to modify the boundaries thereof of vacant, inappropriate and unreserved lands from any part of the public domain . . . which in his opinion are chiefly valuable for grazing and raising forage crops[.] . . ." The Act also provides for the classification of lands for particular uses.
- Executive Orders 11644 (1972) and 11989 (1997) establish policies and procedures to ensure that off-road vehicle use shall be controlled so as to protect public lands.
- Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations), 49 *Fed. Reg.* 7629 (1994), requires that each Federal agency consider the impacts of its programs on minority and low-income populations.
- Executive Order 13007 (Indian Sacred Sites), 61 *Fed. Reg.* 26771 (1996), requires Federal agencies to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions to:
  - Accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners; and
  - Avoid adversely affecting the physical integrity of such sacred sites.
- Executive Order 13084 (Consultation and Coordination with Indian Tribal Governments) provides, in part, that each Federal agency shall establish regular and meaningful consultation and collaboration with Indian tribal governments in developing regulatory practices on Federal matters that significantly or uniquely affect their communities.
- Executive Order 13112 (Invasive Species) provides that no Federal agency shall authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk or harm will be taken in conjunction with the actions.



- Secretarial Order 3175 (incorporated into the Departmental Manual at 512 DM 2) requires that if Department of the Interior (DOI) agency actions might impact Indian trust resources, the agency must explicitly address those potential impacts in planning and decision documents, as well as consult with the tribal government whose trust resources are potentially affected by the Federal action.
- Secretarial Order 3206 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act) requires DOI agencies to consult with Indian tribes when agency actions to protect a listed species, as a result of compliance with ESA, affect or may affect Indian lands, tribal trust resources, or the exercise of American Indian tribal rights.
- Secretarial Order 3215 (Principles for the Discharge of the Secretary's Trust Responsibility) guides DOI officials by defining the relatively limited nature and extent of Indian trust assets, and by setting out the principles that govern the Trustee's fulfillment of the trust responsibility with respect to Indian trust assets.



Appendix B. Ecology

This appendix provides background on the analysis of forest ecological conditions.

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Structural Stage Classification

Conifer forests within the planning area are classified in this analysis by a four-stage structural classification:

Stand Establishment
Young
Mature
Structurally Complex.

These four structural classes are further sub-divided by additional structural divisions and by tree species composition groupings.

Vegetation Series (by plant series)

- **Western Hemlock and Tanoak**: Western Hemlock, Sitka Spruce, Pacific Silver Fir, Tanoak
- **Douglas-fir**: Douglas-fir, Grand Fir, White Fir, Shasta Red Fir, Mountain Hemlock, Ponderosa Pine
- **Non-forest**: Jeffrey Pine, Oregon White Oak, Juniper, Sagebrush, Grassland, Water

These vegetation series are groupings that have been made for this analysis based on plant series and do not exactly correspond to mapped plant series or plant association groupings. The data on plant series was modeled at a very fine scale and has been coarsened in scale for this analysis. Adjustments have been made to the geographic boundaries of these vegetation series grouping to provide explicit boundaries without interspersion.

Classification

Each class appended with Vegetation Series:

- Western Hemlock and Tanoak
- Douglas-fir

1) Stand Establishment
<200 years old in current Forest Operations Inventory
Average tree height <50 feet

1a.) Without Structural Legacies
<6 trees per acre ≥20 inches diameter breast height

1b.) With Structural Legacies
≥6 trees per acre ≥20 inches diameter breast height

The Stand Establishment stage extends from stand initiation until stands have reached canopy closure and density-dependent tree mortality begins. Average tree height reflects the influence of site productivity on tree growth. At an average tree height of 50 feet, stands have passed the point at which they are typically pre-commercial thinned. The minimum density of structural legacies is set at 6 trees per acre to maintain consistency with the minimum green tree requirements in the No Action alternative.

2) Young

<200 years old in current Forest Operations Inventory
Average tree height ≥50 feet

Western Hemlock and Tanoak
<24 trees per acre ≥20 inches diameter breast height

Douglas-fir
<12 trees per acre ≥20 inches diameter breast height

2a.) Young High Density

relative density ≥ 25

2a1.) Without Structural Legacies

Descended from Stand Establishment without Structural Legacies

2a2.) With Structural Legacies

Descended from Stand Establishment with Structural Legacies

2b.) Young Low Density

relative density < 25

2b1.) Without Structural Legacies

Descended from Stand Establishment without Structural Legacies

2b2.) With Structural Legacies

Descended from Stand Establishment with Structural Legacies

The Young stage is characterized by the predominance of density-dependent tree mortality, and, in high density stands, a small range of tree diameters. Young stands have not yet acquired the density of large diameter trees that characterize Mature stands. Young Low Density stands are those with a tree density sufficiently low to largely eliminate the influence of density-dependent tree mortality.

3) Mature

<200 years old in current Forest Operations Inventory

Western Hemlock and Tanoak
≥24 trees per acre ≥20 inches diameter breast height

Douglas-fir
≥12 trees per acre ≥20 inches diameter breast height

3a.) Single Canopy

Western Hemlock and Tanoak
Coefficient of Variation of tree diameters > 10 inches diameter breast

height (CVgt(10)) < 0.35

Douglas-fir
CVgt(10) < 0.34

3b.) Multiple Canopy

Western Hemlock and Tanoak
CVgt(10) ≥ 0.35
<4.7 trees per acre ≥40 inches diameter breast height

Douglas-fir
CVgt(10) ≥ 0.34
<2.1 trees per acre ≥40 inches diameter breast height

The Mature stage generally begins as tree growth rates stop increasing (after culmination of mean annual increment), as tree mortality shifts from density-dependent mortality to density-independent mortality. The threshold values for the Mature stage are derived from Poage (*unpublished*), which comprises BLM timber cruise data for timber sales in the late 1980s and early 1990s. This data presents a precise and accurate sample of the population of trees in timber sale areas. Because timber harvest during that period was predominately in Mature and Structurally Complex forest, this data set, described in Poage (2000), provides a characterization of Mature and Structurally Complex forest on BLM-administered lands.

The thresholds presented here for Mature forest are intended to establish a threshold that represents the structural conditions of most Mature forests, but not necessarily absolute minimum conditions found in all Mature forests. Therefore, the density of large trees (greater than 20 inches in diameter) was derived from the 66th percentile of sample values from the Poage dataset, separating the data for the Western Hemlock and Tanoak, and Douglas-fir vegetation series.

The threshold for canopy layering was derived from the coefficient of variation in tree diameters, inferring that variation in tree diameters is reflected by variation in tree heights. The threshold here was derived by the mean coefficient of variation of tree heights minus one standard deviation from the Poage dataset.

This analysis initially examined other measures of canopy layering, included a Canopy Height Diversity index (Spies and Cohen 1992), a Diameter Diversity Index (McComb et al. 2002), and a canopy classification technique in Baker and Wilson (2000).

The Canopy Height Diversity index uses data on tree heights directly, but classified most existing stands over 200 years old in this analysis as "single canopy," and therefore would be too restrictive.

The Diameter Diversity Index infers canopy height diversity from weighted values of tree diameters. The weighting values produce results that may be more effective at classifying existing stands than evaluating modeled stands. The Diameter Diversity Index results do not appear to accurately reflect future changes in canopy layering resulting from thinning or partial disturbance and would classify relatively young, even-aged stands as "multiple canopy."

The technique in Baker and Wilson (2000) uses tree height and canopy measurements, but would classify almost all stands in this analysis as "multiple canopy."

Coefficient of variation in tree diameters provides greater discrimination among the stands in this analysis than the other measures and appears to be sensitive to future changes in stand conditions. Coefficient of variation in tree diameters could provide misleading results in strongly bi-modal stands (i.e., very large trees and very small trees), which would be a concern if this analysis were attempting to provide continuous values of canopy layering. But this analysis is only attempting to classify stands as either single canopy layered or multiple canopies.

4) Structurally Complex

4a.) Existing Structurally Complex

4a1.) Existing Old Forest

200-399 years old in current Forest Operations Inventory

4a2.) Existing Very Old Forest

≥400 years old in current Forest Operations Inventory

4b.) Developed Structurally Complex

<200 years old in current Forest Operations Inventory

Western Hemlock and Tanoak

CVgt(10) ≥0.35

≥24 trees per acre ≥20 inches diameter breast height

≥4.7 trees per acre ≥40 inches diameter breast height

Douglas-fir

CVgt(10) ≥0.34

≥12 trees per acre ≥20 inches diameter breast height

≥2.1 trees per acre ≥40 inches diameter breast height

This analysis assumes that stands identified as 200 years old or older in the current stand inventory are Structurally Complex forest. In addition, stands that are not 200 years old or older but meet threshold values for Developed Structurally Complex described above are identified as Structurally Complex forest. Threshold values for Developed Structurally Complex include

density of very large trees (greater than 40 inches in diameter) derived from the 66th percentile of sample values from the Poage dataset, separating data for the Western Hemlock and Tanoak and Douglas-fir vegetation series.

Structurally Complex stands approximate "old-growth" stands described in many analyses (see, e.g., District RMP/EISs), "Medium/large Conifer Multi-story" stands described in the FEMAT Report, and "Large, Multi-storied Older Forest" stands described in the LSOG Monitoring Report. In this analysis, "late-successional forest" encompasses both Mature and Structurally Complex stands, similar to how the Northwest Forest Plan FSEIS used "late-successional forest" to encompass mature and old-growth forests (p. Glossary-9). The LSOG Monitoring Report summarized the difficulties in describing and classifying older forest conditions (pp. 9-10).

Table 238. Comparison of different stand classification schemes and the structural stage classification used in this RMP/EIS. A more extensive comparison of classification schemes can be found in Franklin et al. 2002.

Typical stand age[1] (years)	Oliver (1981) stand development stages	Franklin et al. (2002) structural stage	1994 RMP/EIS Seral stage	Structural stages (This RMP/EIS)
0		Disturbance and legacy creation		
20	Stand Initiation	Cohort establishment	Early seral	Stand Establishment
			Mid seral	
30	Stem Exclusion	Canopy Closure		Young
50		Biomass accumulation/ competitive exclusion	Late seral	
80	Understory Reinitiation	Maturation		Mature
150	Old Growth	Vertical diversification	Mature seral	
300		Horizontal diversification	Old-growth	Structurally Complex
800-1200		Pioneer cohort loss		

[1] Stand ages are provided as references. However, stands can achieve structural classes at different stand ages, depending on disturbance and site conditions

Interagency Vegetation Mapping Project Data

Existing vegetation mapping for the planning area was based on the Interagency Vegetation Mapping Project (IVMP), which provides maps of existing vegetation, canopy cover, size, and cover type for the entire range of the Northern Spotted Owl using satellite imagery from Landsat Thematic Mapper (TM). The LSOG Monitoring Report contains detailed descriptions of the IVMP data and evaluations of IVMP map accuracy (Moeur et al. 2005, pp. 18-30, 108-109, 123-128). Those descriptions and evaluations are incorporated here by reference.

The IVMP was initiated in 1998 under joint program management and funding by the Bureau of Land Management-Oregon and the Forest Service-Region 6. The project's goal was to provide consistent spatial data for monitoring older forests within the portions of the Plan area in Washington and Oregon. The IVMP mapped existing vegetation in the nine physiographic provinces in Washington (Eastern and Western Cascades, Olympic Peninsula, and Western Lowlands) and Oregon (Eastern and Western Cascades, Coast Range, Willamette Valley, and Klamath Mountains).

The IVMP modeling approach combined remotely sensed satellite imagery (25-m Landsat TM), digital elevation models, interpreted aerial photos, and inventory information collected on the ground to classify existing vegetation. Landsat scenes used in the IVMP project ranged from fall 1992 through summer 1996. Of the 17 scenes, 2 were acquired in 1992, 1 each in 1994 and 1995, and 13 in 1996. A regression modeling approach was used to predict vegetation characteristics from this Landsat data.

Inventory plot data were used as reference information for IVMP model building and accuracy assessment. Almost 10,000 plots were used for model building and testing, and another 2,800 plots were held out for an independent accuracy assessment. These data came primarily from Current Vegetation Survey (CVS) plots maintained by Forest Service-Region 6 and Bureau of Land Management-Oregon on Forest Service and Bureau of Land Management lands in Washington and Oregon, and from Forest Inventory and Analysis (FIA) plots administered by Pacific Northwest Research Station on nonfederal lands.

All IVMP map data and supporting documentation are available online at

http://www.or.blm.gov/gis/projects/ivmp.asp

Average Historical Conditions and the Historic Range of Variability

The description of the Affected Environment and the analysis of effects include a comparison of current and future conditions to the Historic Range of Variability. Characterization of historic landscape conditions can provide a reference point for comparison in the analysis of effects of different land management strategies. Historic landscape conditions were dynamic, which requires characterization of landscape conditions as a range, rather than a discrete point.

There are several challenges in describing the Historic Range of Variability:

1. Selecting metrics

Historic Range of Variability is often described by abundance of habitat types and frequency of disturbance, such as mean fire return interval. Some descriptions have included spatial pattern of habitats, such as patch size. Because the Historic Range of Variability is a range, it is not easily quantified, and at many spatial scales, the range is very broad (see, e.g., Wimberly et al. 2000). Simply describing an upper and lower bound of historic conditions may overemphasize the rare, extreme events that defined the bounds (Landres et al. 1999). However, more sophisticated descriptions may be difficult to communicate to decision-makers and the public, and may be difficult to compare to the effects of different land management strategies.

2. Selecting the portion of history

Historical conditions varied not only in a range of natural disturbance frequencies, but with patterns of pre-European anthropogenic disturbances and with climate changes. The selection of the portion of history to characterize can strongly influence the resulting "range" that is described (Millar and Woolfenden 1999, Long et al. 1998).

3. Incomplete and unavailable information

Our knowledge of historical landscape conditions is fragmentary at best. Descriptions of Historic Range of Variability have been built from pollen deposits in lake sediments, tree-ring data, fire-scar data, even animal deposits, such as pack-rat middens. These records are incomplete. Reconstructions from such data sources require inference and modeling to derive a description of Historic Range of Variability.

4. Change from historical conditions

Some biological and physical characteristics have changed irreversibly from historic conditions and may distort any comparison to Historic Range of Variability. Climate conditions have changed and are continuing to change at a rapid rate. Species introductions and species extirpations have altered biological relationships.

These challenges should be considered in interpreting the Historic Range of Variability and caution against using it as an explicit target or management objective.

Several commentors have hypothesized that a landscape that reflects the abundance and arrangement of habitats within the Historic Range of Variability will support the species and processes that were historically present, and that the further the landscape lies outside the Historic Range of Variability, the less likely it will support those species and processes (see, e.g., Landres et al. 1999). These hypotheses remain largely untested, but several studies have characterized the historic range of variability in western Oregon and used it as a reference point to compare the effects of management strategies (Nonaka and Spies 2005, Wimberley 2002, Wimberley et al. 2000, Cissel et al. 1999, Rasmussen and Ripple 1998).

This analysis uses the description of habitat abundances and mean fire return intervals from the draft Rapid Assessment Reference Condition Models (USFS and BLM 2005). These models derived historic abundances by modeling disturbance probabilities generated from mean fire return intervals combined with the probabilities of other disturbances such as wind, insect and pathogens. These models described the average amount of the landscape that would be expected in each of the broad vegetation classes, which are roughly equivalent to the structural classes used in this analysis.

This analysis used the description of spatial patterns of habitat types from Nonaka and Spies (2005), which modeled historic spatial pattern in the Coast Range. Although this research applies to only a portion of the planning area, it presents an available description of historic spatial pattern. The historic spatial pattern in the other provinces in the planning area likely differed from the Coast Range, and therefore the comparative value of this description of Historic Range of Variability is limited and must be used with caution.

FRAGSTATS

FRAGSTATS is a computer software program designed to compute a wide variety of landscape metrics for categorical map patterns. The original software (version 2) was released in the public domain during 1995 in association with the publication of a USDA Forest Service General Technical Report (McGarigal and Marks 1995).

The following discussion is summarized from the FRAGSTATS website (http://www.umass.edu/landeco/research/fragstats/fragstats.html), which describes FRAGSTATS in detail, those descriptions incorporated here by reference.

FRAGSTATS is a spatial pattern analysis program for categorical maps. The landscape subject to analysis is user-defined and can represent any spatial phenomenon. FRAGSTATS simply quantifies the areal extent and spatial configuration of patches within a landscape; it is incumbent upon the user to establish a sound basis for defining and scaling the landscape (including the extent and grain of the landscape) and the scheme upon which patches are classified and delineated. The output from FRAGSTATS is meaningful only if the landscape mosaic is meaningful relative to the phenomenon under consideration.

FRAGSTATS computes 3 groups of metrics. For a given landscape mosaic, it computes several metrics for: (1) each patch in the mosaic; (2) each patch type (class) in the mosaic; and (3) the landscape mosaic as a whole. The FRAGSTATS website contains a detailed description of the metrics.

The FRAGSTATS website includes a discussion on the conceptual background of FRAGSTATS analysis, including advice and caveats about use of the software. Key points from that discussion are summarized here.

A landscape is not necessarily defined by its size; rather, it is defined by an interacting mosaic of patches relevant to the phenomenon under consideration (at any scale). It is incumbent upon the investigator or manager to define landscape in an appropriate manner. The essential first step in any landscape-level research or management endeavor is to define the landscape, and this is of course prerequisite to quantifying landscape patterns.

Classes of Landscape Pattern

Real landscapes, at any scale, contain complex spatial patterns in the distribution of resources that vary over time. Quantifying these patterns and their dynamics is the purview of landscape pattern analysis. Landscape patterns can be quantified in a variety of ways depending on the type of data collected, the manner in which it is collected, and the objectives of the investigation. Broadly considered, landscape pattern analysis involves four basic types of spatial data corresponding to different representations of landscape pattern. These look rather different numerically, but they share a concern with the relative concentration of spatial variability:

(1) **Spatial point patterns** represent collections of entities where the geographic locations of the entities are of primary interest, rather than any quantitative or qualitative attribute of the entity itself.

(2) **Linear network patterns** represent collections of linear landscape elements that intersect to form a network.

(3) **Surface patterns** represent quantitative measurements that vary continuously across the landscape; there are no explicit boundaries (i.e., patches are not delineated). Here, the data can be conceptualized as representing a three-dimensional surface, where the measured value at each geographic location is represented by the height of the surface.

(4) **Categorical (or thematic; choropleth) map patterns** represent data in which the system property of interest is represented as a mosaic of discrete patches. From an ecological perspective, patches represent relatively discrete areas of relatively homogeneous environmental conditions at a particular scale. The patch boundaries are distinguished from their surroundings by abrupt discontinuities (boundaries) in environmental character states of magnitudes that are relevant to the ecological phenomenon under consideration

Patch-Corridor-Matrix Model

Patch must be defined relative to the phenomenon under investigation or management; regardless of the phenomenon under consideration (e.g., a species, geomorphological disturbances, etc), patches are dynamic and occur at multiple scales; and patch boundaries are only meaningful when referenced to a particular scale.

It is incumbent upon the investigator or manager to establish the basis for delineating among patches and at a scale appropriate to the phenomenon under consideration.

Corridors are distinguished from patches by their linear nature and can be defined on the basis of either structure or function or both. If a corridor is specified, it is incumbent upon the investigator or manager to define the structure and implied function relative to the phenomena (e.g., species) under consideration.

It is incumbent upon the investigator or manager to determine whether a matrix element exists and should be designated given the scale and phenomenon under consideration.

The Importance of Scale

One of the most important considerations in any landscape ecological investigation or landscape structural analysis is (1) to explicitly define the scale of the investigation or analysis, (2) to describe any observed patterns or relationships relative to the scale of the investigation, and (3) to be especially cautious when attempting to compare landscapes measured at different scales.

Landscape Context

A landscape should be defined relative to both the patch mosaic within the landscape as well as the landscape context. Moreover, consideration should always be given to the landscape context and the openness of the landscape relative to the phenomenon under consideration when choosing and interpreting landscape metrics.



Appendix C. Socioeconomics

This appendix provides background on the analysis of socioeconomic conditions.

In this appendix:

Analysis of Socioeconomic Effects 955

Analysis of Socioeconomic Effects

The socioeconomic analysis describes the impacts of the alternatives in terms of:

Employment – full time equivalent jobs by economic sector.

Income – wages associated with employment.

Payments to Counties – Counties' share of the revenues paid to BLM.

BLM budget – Money spent for BLM personnel, services, equipment, etc.

Contract costs – Money spent on contracting certain silvicultural costs.

Present net value – Sum of discounted revenues and costs associated with the timber sale program.

Employment, income and payments to counties were calculated at the County level, for each of the eighteen O&C Counties. BLM budgets and contract costs were calculated at the BLM District level. The present net value was calculated for the entire planning area.

Process Overview

The OPTIONS model provided data about the volume and size of timber in each harvest unit, and the type of harvest (regeneration, partial cut, thinning). Historic BLM timber sale data were used to estimate species mix and log grade for each proposed harvest unit and values by grade and species. A stumpage value was estimated for each harvest unit, based on the volume and grade of timber, logging costs and average road costs. For the first decade, the estimated stumpage was reduced 3.5 percent based on an analysis of the market price impact of selling additional BLM timber. The adjusted estimated stumpage value formed the basis for calculating total BLM timber revenues and BLM payments to counties.

Harvest by county was allocated to specific manufacturing centers using the Western Oregon Model, described below. In addition, the Western Oregon Model projected the impact of additional BLM timber on the market price of timber, and the effect on private harvest levels. This model also projected the value of the products produced at each manufacturing center – data used in the county-level input output models.

County-level Input/Output (I/O) models were built for each of the O&C Counties, and calibrated to local economies based on field visits and additional research. Given the value of wood products production in each County, and the federal payments to each County, changes to employment and income were projected.

Changes to the BLM budget were estimated using a unit cost associated with timber harvest. Contractor costs were based on the amount and type of harvest specified by the OPTIONS model.

The present net value calculation is based on the stumpage values derived from the OPTIONS model for five decades, and the estimated cost of the BLM timber program.

Information about County budgets, how reliant each County is on BLM payments, and how each County spends the BLM payments was based on a survey of the 18 O&C Counties.

The following sections describe each of these processes in more detail. More complete descriptions can be found in the references.

The Western Oregon Model

The Western Oregon Model was developed at Oregon State University by Darius Adams and Greg Latta. It is used to analyze questions about timber supply, public policies and how markets might respond to changes in fundamental factors.

The Western Oregon Model has five basic components: (i) inventory data describing private lands; (ii) assumptions about likely future silvicultural regimes to be applied to those lands; (iii) projections of future timber yields under the several regimes; (iv) assumptions about changes in timberland area through gains or losses to other uses or owners; and (v) a model that projects future harvests based on inventory and other assumptions, applies the management regimes, and updates the inventory over time.

Inventory

The approach involved projecting and harvesting the plots in a simulation system designed to mimic actual growth and harvest. Inventories were brought to a common starting point (2003) using a harvest scheduling model that selected plots (condition classes in western Oregon) for harvest to maximize the present net worth of timber returns over the period from the inventory date to 2003. Simulated harvesting was constrained to mimic actual historical cut by year and owner at the county level. Cut by species group, period-to-period changes in harvest per acre, and the area partial cut were constrained at the half-state level (the finest scale for which historical data are available). In this process, tree lists from the original plots were updated using a version of the Forest Vegetation Simulator (Dixon 2003).

Management Intensity Classes

A Management Intensity Class is a regime of silvicultural activities applied over the life of a stand. In this analysis, stands are classified as either: (i) "existing," those that are part of the original inventory at the start of the projection, or (ii) "new," those that are regenerated during the projection. There are seven Management Intensity Classes for existing stands and eight for new stands.

Yield Projections

Yields for each Management Intensity Class in each stand were generated using one of three regional variants of the Forest Vegetation Simulator. It is assumed that, by ecoregion, the stems per acre and species composition in new naturally regenerated stands were the same as that derived from averages for all young stands from the Forest Inventory Analysis database.

Land Area Changes

It is assumed that the general direction of past area trends will continue over the next 15 years but at reduced rates. The recent historical gain in western Oregon's private base was small, and a constant timberland area for that region is assumed.

Market Model

Timber harvest is a measure of the processing activity on the supply side of the regional log market. A model of the western Oregon log market that explicitly recognizes the spatial dispersion of log processing facilities and the forested lands that supply logs was constructed. Demand is derived from lumber and plywood production and log exports, all of which are sensitive to the delivered price of logs. The supply of logs in the short term is based on private owners' decisions about harvest timing to optimize the value of their timber investments given stand growth and interest rates. In the longer term, it depends on management (silvicultural) investments because these are influenced by anticipated yield increments, management costs, interest rates, and price expectations.

Log processing is grouped into specific milling or processing centers in the region. Mills generate a demand for delivered logs at these centers, which varies with log price up to the point of capacity. Log demand would shift depending on product prices, technology, non-wood costs, and capacity. Capacity itself is not fixed but varies with product prices, equipment costs, depreciation, and interest rate. Potential sources of private log supply lie at various distances from the processing center and have varying cost characteristics depending on the types of forest management, logging conditions, haul distances, and the interest rate.

Additional Assumptions

In the projections, assumptions about future prices of products and of labor and "other" variable inputs were derived from the 2005 Resource Planning Act Timber Assessment Update (U.S. Forest Service 2005, Timber Assessment Update)[1].

[1] Draft available online at www.fs.fed.us/pnw/about/programs/hnri/index.shtml ; last accessed Jan. 27, 2006.

Harvest from public lands is determined by policies within the respective managing agencies and generally is not sensitive to log price over the five-year time interval used in this analysis. Consequently, public log supply is treated as exogenous and it is assumed that it will remain constant at recent (2000–2002) average levels throughout the projection. Alternative scenarios of BLM timber harvest were constructed by varying the exogenous levels of BLM cut according to the conditions of the scenario.

Public harvest is set at the county level in the model and the costs of moving logs from public lands to mills estimated using an average haul distance from each county to each milling center.

County level Input Output models

Input/output models (I/O) are automated process models that scale national-level economic relationships to fixed-structure county databases. Critical input/output data was abstracted from published source data and active field surveys. The general approach contains four analytical phases:

1. Collection of secondary economic indicator data for the county level from a combination of published and on-line data sources.

Those data sources form a large database for each separate county model. The data matrix is recalibrated from field survey data for key sectors such as wood products and major manufacturers. Data on unearned income, including transfer payments and property income comes from the U.S. Bureau of Economic Analysis' Regional Economic Information System database. Data on seasonal homes in the study area, population and household comes from the U.S. Census Bureau website and Portland State University. County-level wage rates are found in the Oregon Labor Market Information System (OLMIS).

2. Comparison of similar data from multiple sources (including cooperators and other BLM contractors) and refining it with our field calibration surveys.

We received primary source records of BLM harvests, budget allocations and practices as well as historical payments to counties[2]. BLM payments were put in context to all county budget sources.[3] We used secondary state historical data to establish the relative BLM harvest contribution.[4] Spatial log flows are proportioned based on an earlier flow survey.[5] For loggers, we gathered logger data[6], found discrepancies in association estimates[7] and logger safety records[8], so we augmented these estimates from federal proprietor data[9]. Industrial production data came from numerous surveys and models. These estimates were tested and augmented by ForestEcon, Inc. field surveys. We used two sources of log using mill location and activities[10],[11], which were later adjusted to compromise with other estimates. [12]

3. Conducting field surveys to gather detailed data on socio-economic conditions.

Field interviews are augmented by follow-up telephone surveys. In each county, Dr. Dan Green, regional economist, and Maryann Green, resource biologist, both of Economic Analysis Systems contacted county government leaders, wood products industry employers, and businessmen in leading or potentially sensitive economic sectors. Their objective was to test the accuracy of secondary data, add detail to quantitative descriptions of each county's total economy and selective precision for expected critical sectors and ensure that revised data are generally acknowledged as accurate and representative.

3. Analysis of data, including supplemental analyses mostly completed by other contractors and cooperators.

The Timber Assessment Market Model provided regional estimates of stumpage price and owner harvest substitution estimates.[13] These estimates are used to estimate alternative payments to counties.[14] The Western Oregon timber model runs generate new spatial log use, and wood products production patterns by BLM alternative.[15]

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2 BLM records, Association of O&C Counties Tabulation 10/5/2006, and USFS ASR payments to counties by national forest tabulation 12/22/2006

3 Kevin Davis, Association of O&C Counties

4 Gary Lettman, Oregon Department of Forestry forest economist

5 Jason Brandt, Montana Bureau of Business and Economic Research

6 Oregon Department of Labor

7 Oregon Association of Loggers

8 Oregon Dept of Logger Safety

9 US Department of Commerce

10 Oregon State University

11 Ehinger, Paul. 2006. Western Oregon Wood Products Mill survey

12 Western Oregon Model ibid

13 Darius Adams, Oregon State University

14 Mark Rassmussen, Mason, Bruce and Girard Inc.

15 Greg Latta, Oregon State University

Model Development Process

Dr. Green, our Economic Analysis Systems cooperator, uses a field survey calibration of county economic data bases and builds unique selective precision spreadsheet Input/Output model. The Economic Analysis Systems modeling process is based on a unique resource economy representation technique.[16] The methodology was developed for USDA-Forest Service spatially-sensitive community impact analyses where canned I/O models obscure or misrepresent impacts.

Establish model geography and resolution

We chose a county level of resolution so that most O&C impacts would be captured. That required a set of 17 county models as we decided to represent counties where O&C lands were few, but that O&C operations had economic influences.

Develop County-level databases

A database for each of the models is first assembled from published, on-line data sources, and survey data collected in 2006. The county databases included employment, wage and salary earnings, total industry output, unearned income, seasonal home spending, population, households, commuting patterns, wage rates, residency, employment status, tax rates, and savings and consumption rates (marginal and average propensity to consume locally).

Construct preliminary county models

A preliminary county model for the model areas is constructed from the secondary data sources. Its content and structure are similar to that used by IMPLAN. Employment and earnings totals in the models are controlled to Regional Economic Information System totals for each county. Industrial output by industry for each of the county models was derived using employment/output ratios obtained from the respective county models. The Economic Analysis Systems approach used the "selective precision" approach.[17] With this approach, on-the-ground verification focuses on a select number of sectors that are expected to play a significant role in the analysis. Each of the county models is constructed using a combination of spreadsheet programs along with a mathematical software program, GAUSS[18], which handles complex mathematical operations.

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16 Robison, M. Henry. 1997. Community Input/Output Models for Rural Area Analysis. Annals of Regional Science. Vol 31(3) pp 325-351

17 Richardson. 1972.

18 Aptech Systems Software. GAUSS mathematical and statistical system

Calibrate County models

In general, data and relationships for sectors that play an important role in the local economy and that are a key component of the economic base were adjusted with on-the-ground verified data as appropriate.

Modify export base in Key Economic Sectors

Use of mechanical techniques typically results in local absorption of the output of a variety of local industries that export all of their output (i.e., an extreme case of underestimating exports). Export sales are adjusted based on survey data for all key sectors in the analysis (such as wood products) and other sectors such as agriculture that are principal components of the economic base.

Perform sensitivity analyses and adjustments

Preliminary runs of the models using a range of input variables are undertaken to determine whether the model's projections of impacts were reasonable. This procedure focuses on the wood products sector of the county model. Multipliers from the model are also compared to multipliers developed by the U.S. Bureau of Economic Analysis Regional Input-Output Modeling multipliers and for IMPLAN models of the area and to a county model (Western Oregon).

Timber Assessment Market Model

The Timber Assessment Market Model focuses on the solid wood products sector and also provides the linkage between products markets (solid wood and pulpwood) and the timber inventory. Since its inception in the late 1970s, the model has undergone a number of extensions and revisions designed to improve the realism of its projections and the utility of its output to resource analysts and policymakers.

The Timber Assessment Market Model is a special model of the solid wood and timber inventory elements of the United States forest products sector and of softwood lumber and OSB production in Canada. The Timber Assessment Market Model provides annual projections of volumes and prices in the solid wood products and sawtimber stumpage markets, and estimates of total timber harvest and inventory by geographic region for periods of up to 50 years.

The demand module for softwood solid wood products uses Spelter's diffusion analysis of demands for softwood lumber, softwood plywood, and oriented strand board/ waferboard. The current wood products supply module assumes that product output is obtained in fixed proportions to log input (the product recovery factor linkage) but in variable proportions to all other factors, implying that logs are separable from other inputs in production. Given the assumptions of fixed log input-product output relations in the Timber Assessment Market Model, the derived demand for logs is simply the

product of recovery factors times output. The supply of wood to processing facilities is modeled as a mixture of price-sensitive relations, and exogenous flows describing the volumes of timber available for immediate harvest and the volumes of logs delivered to mills. The Timber Assessment Market Model also includes a program module that provides linkage to the ATLAS timber inventory system for the solid wood, paper and board, and fuelwood models.

Survey of counties

To better understand County budgets, and the role that BLM payments play in those budgets, MB&G sent a questionnaire to each of the 18 O&C Counties. Follow up phone calls clarified unclear answers.

County Budget Data for FY2005 – BLM Western Oregon Plan Revision

County: _____
Contact Person: _____
Phone: _____

PART 1 – FISCAL YEAR 2005 BUDGET

	Fiscal Year 2005 Total Budget (including Discretionary Budget)	Fiscal Year 2005 Discretionary Budget Only
County Expenditures *(see following page for definition of categories)*		
Health & Community Services		
Public Safety		
Economic Dev., Natural Res. & Recreation		
Transportation & Land Use		
Other Community Services		
Debt Service		
Other (Specify):		
_____		
_____		
Total Expenditures		
County Revenues		
State Transfers & Reimbursements		
Property Taxes		
Safety Net Payments associated with O&C Lands		
Safety Net Payments associated with USFS Lands		
Other Federal Grants & Payments		

Fees, Charges for Services		
City, Special District & Other County Payments & Reimbursements		
Interest Earnings		
Bonding or other borrowing		
Other (Specify):		
_____		
_____		
_____		
Total Revenues		

PART 2 – HISTORIC COUNTY EXPENDITURES

Fiscal Year	Total Budget (including Discretionary Budget)	Discretionary Budget Only
1985		
1990		
1995		
2000		
2001		
2002		
2003		
2004		
2005		

Part 3 - Describe primary expenditures of discretionary funding

Please describe in as much detail as possible the specific uses for discretionary funds in your County. Your responses to Part 1 above puts expenditures in general categories. It would be very helpful to have more detail about specific programs and projects supported by O&C and other discretionary funds in recent years. Please feel free to attach graphs, charts, or other descriptive budget documents that help explain how your County uses its discretionary funds.

BLM Budget

To calculate changes to the BLM budget, the non-timber portion of each District's budget was calculated from the FY 2006 budget data. The timber portion of the budget was calculated using a fixed rate of $159/Mbf. This figure was based on historic budget information.

Timber Program Costs

Timber program costs for the present net value calculation were based on historic BLM budget data as $200/Mbf. This includes overhead at the District and State offices.

Expenditure Categories		
Health & Community Services	• Aging Services • Alcohol & Drug Addiction Services • Services for Children & Families • Developmentally Disabled • Mental Health Services • Oregon Health Plan Services	• Veterans Services • Public Health Services • Environmental Health Services • Housing Services • Medical Examiner • Solid Waste Disposal/Recycling
Public Safety	• Trial Courts • District Attorney • County Jail • 911/Emergency Communications • Emergency Management • Homeland Security	• Community Corrections • Court Security • Juvenile Services • County Law Library • Sheriff Patrol • Animal Control
Economic Development, Natural Resources and Recreation	• Oregon Plan Implementation • State Forest Management • Federal Land Policy • Extension Services • Telecommunications • County Fair	• Watermaster • County Forests • County Library • County Parks • County Museums
Transportation & Land Use	• Highway & Road Systems • Land Use Planning & Coordination • Senior & Disabled Transportation • Development Services	• Engineering • Building Permitting & Inspections • Surveying • Capital Projects
Other Community Services	• Management & Administration • Elections • Assessment & taxation • Human Resources & Employee Relations	• Property & Facilities Management • Procurement • Recording Public Documents



Appendix D. Timber

This appendix provides background on the analysis of timber valuation effects and the process for completing a 10 year scenario to verify the practicality of harvest scheduling the OPTIONS modeling results and to assist in estimating the effects of the alternatives.

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Timber Valuation

The estimate of values which would be produced by the different alternatives must take into account the volume and quality of the timber offered, and the cost of harvest and transportation. The estimate of stumpage is being completed as a portion of the analysis of effects of the alternatives the first 10 years. As the alternatives are projected forward beyond the first 10 years, changes are expected in the receipt levels as the mix of sizes, quality and species changes in response to the harvest of different stand types, growth of other stands, and the application of silvicultural practices.

Stumpage and receipts will be generally be calculated in following manner:

Stumpage = Pond value – harvest and transportation costs.

- Pond value will be a weighted pond value inclusive of both the species mix and grade of logs anticipated from the different levels and types of harvest.
- Harvest and transportation costs will be an average by harvest type for each district.

Receipts will be the sum of all stumpage prices multiplied by the corresponding log volumes.

Analytical assumptions

Prices and costs will be calculated in constant dollars, set at 2005.

Costs, species composition, recovery and grade will be developed using an historical reconstruction approach with a variety of base periods.

Costs were developed for each district by two harvest types, thinning and regeneration harvest. Sales were selected from a base period of 1996 thru 2006. The first year of the forest plan, 1995 was not used due to expected bias since watershed analysis had not yet been completed on the majority of BLM-managed lands and no road construction could be undertaken in Riparian Reserves until the completion of watershed analysis for individual watersheds.

Sales which were actually offered were included as provided by the districts, in response to a data query. Sales where data was incomplete were excluded.

Sales were included regardless of award and execution or litigation. Volume weighted averages by thinning and regeneration harvest were developed for each district to obtain a "standing tree to mill" cost including cutting, yarding, road construction, transportation, maintenance, miscellaneous and other costs used in the standard BLM appraisal methods. All costs were expressed in dollars per thousand board feet (MBF) for 16-foot short-log, Scribner scale. Costs varied considerably by district with the cost of hauling logs to the mills one of the more variable. Costs for thinnings were generally higher than for regeneration harvest.

Costs for thinning will be used in the analysis for the thinning, uneven-age harvest, and partial harvest treatments described in Alternative 3.

A base size of approximately 1,100 million board feet was included in order to estimate costs, with a total cost of over $390 million in 2005 dollars.

Species composition

Commercially valuable species compositions for the analysis were developed for each district, using an historical reconstruction technique. Volumes and percentages of volume by species were developed using the period 1990 thru 2006(in part) as the base period.

Analysis of the data contained in the species data base of TSIS (Timber Sale Information System), the BLM accounting and record keeping system for timber sales, indicates a high level of similarity of species between districts with the exception of the Klamath Falls Resource Area.

Douglas-fir is the dominant commercial species with all districts having a harvest percentage of Douglas-fir by volume at or near 80 percent. Stratifying the base period into pre-Northwest Forest Plan, (1990-1995), early Northwest Forest Plan (1996-2000), and current Northwest Forest Plan era (2001-2006) yields only minor changes in species composition of sales. This species percentage composition has remained generally constant despite a substantial change in the harvest types and ages harvested over these three periods.

No formal sampling method was used to select a sample of sales available for use. Sales with missing or incomplete information were excluded. Some sales from the base period had been archived from TSIS, and were not included, as information was not available. Emphasis was placed on including large sales, as well as those from pre-Northwest Forest Plan years. Sales of less than one million board feet and those consisting of primarily fire salvage were excluded.

Log Quality

Log quality was estimated using historical reconstruction of log grades weighted by volume. Few sales were available in older forest types across the districts for the Northwest Forest Plan era, so sales from 1985-1990 were used to develop estimates for harvest of older timber, with the exception of Coos Bay district, where no records of this time could be located. For the Coos Bay district the base period of 1970-1975 was used.

Sales were included when the data was available, complete and legible. Sales of less than one million board feet were excluded as were certain salvage sales where species bias was likely. With the exception of the Klamath Falls resource area, 150-300+ MMBF were included in the reconstruction base for each district.



District cruiser estimates were used for grade breaks in thinnings where the price differences between lower sawlog grades are low.

Four types of forest stands were used to estimate quality by percent of volume. First are thinning stands. These were typically commercial thinning or density management treatments designed to remove/prevent suppression mortality and improve stand composition, vigor or value. Cruiser estimates of sawlog grade percentages will be used for these stands, in particular the DF 4 sawlog. The second type is regeneration or clearcut treatment in young stands, typically less than 80-100 years of age depending upon site quality. A modest number of pre-Northwest Forest Plan stands are available for this estimation, and some Northwest Forest Plan regeneration harvests fall within this category. The third type is mature stands, generally older than 80-100 years, typically dominated by one species, and generally of higher overall density. These stands correspond to the mature structural stage. Fourth are stands older than 150-200 years corresponding to the structurally complex classification. A more complete description of these structural stages is contained in Appendix 12: Ecology, Section I – Structural Stage Classification.

For each district, average percentages by log grade for each of these structural classes will be prepared for Douglas-fir, ponderosa pine, white fir, and sugar pine. Other species will be estimated using a camp run method with no grade differentiation. Analysis of the data indicates that higher log grades in other than these four species are rare.

The sales used as a basis were classified by structural stage class, described above, using a combination of local knowledge, species composition, average log size in board feet, and average number of Douglas-fir trees per acre.. Typically, stands with more than 100 trees per acre and an average log volume of less than 100 board feet would be in the "young" stand classification. The "structurally complex" class would contain stands with less than 40 trees/acre of the dominant species and average log volume generally greater than 200 board feet. The "mature" stand class would lie between these figures. These levels will differ by district based on differences in site productivity. Volume weighted percentages of grades were then developed by structural classes and by district.

Preparation of weighted pond values

Species composition will be assumed to be similar between regeneration harvest and thinning.

Species were consolidated into commonly used groups for which prices are available. For example, true firs and hemlocks were consolidated into "white wood"

For Douglas-fir, sugar pine and ponderosa pine, prices will be a weighted average by grade for the stand categories of young, mature and structurally complex.

Prices for species and grades, where applicable, were averaged levels for calendar year 2005 for commonly priced groups, using data obtained from Log Lines Log Price Reporting Service (published monthly) PO Box 2215 Mount Vernon WA 98273, loglines@fidalgo.net)."

Weighted pond values for each district were then prepared for young, mature and structurally complex stand classes using the pricing groups, grade weighted prices for Douglas-fir, sugar pine, and ponderosa pine, and consolidated percentages for grouped species such as true firs and hemlocks with their associated camp run prices. Log volumes and prices published in Log Lines are based on 32 foot long-log volumes. BLM volumes are expressed in 16-foot short-log, Scribner scale. Conversion factors used to adjust prices to 16-foot short-log were 0.8 for sawlog grades and 0.85 for peeler grades

The above matrix of weighted pond values will be held in 2005 dollars for the 10 year estimate of stumpage and receipts, as will costs.

Calculation of bid ratio

The period between 1990 and 2006 was used to calculate an average bid ratio for each district. This information was extracted from the BLM's TSIS database system and was volume weighted.

Preparation of stumpage and receipt estimation

For each district, each harvest type and each stand structural stage matrix will be prepared which will subtract harvesting costs from weighted pond values. Thinning costs will be used for the partial harvest in Alternative 3 due to the anticipated difficulties associated with this type of harvest in mature and structurally complex stands.

Once a matrix of stumpage values for the various treatments and stand categories has been prepared, anticipated receipts are calculated by multiplying the stumpage value per thousand board feet by the corresponding harvest level by structural stage to obtain a total expected price for the 10 years.

No correction for the "delay" in harvest after sale will be made. After a sale is sold and executed, a delay in sale receipts will normally occur since receipts are not generated until harvest occurs. This may be immediately after execution, or may be delayed depending upon seasonal requirements, sale specifications such as required construction or market conditions. In a similar manner, no delay will be assumed for litigation of individual sales.

Ten-Year Scenario Quality Check

The ten-year seenario is a method of both verifying the praetieality of the harvest scheduling as modeled, and a method of estimating the effeets to soils and hydrology by developing estimates of road eonstruetion and acres harvested by harvesting method.

The ten-year seenario is a simulation, and is a single solution to harvest seheduling in the first ten years. There may be a large number of solutions to implementation in the first 10 years in terms of both harvest loeations and harvest types. It is intended to be representative of the implementation of the plan for the first 10 years, but is not intended to be used to prediet or deeide locations of aetual harvest units.

Procedure

Onee harvest units are modeled by OPTIONS as harvested in the first 10 years, the locations and harvest types are mapped with aeeompanying tables of information. These maps are distributed to the districts for analysis. Distriet planners and others familiar with harvest unit design and road systems develop road locations and harvest methods for the selected units. These designs are eaptured in a Geographic Information System mapping database and assembled for analysis.

The OPTIONS model seleets units for harvest based on a WOPR ID number. These WOPR ID units are polygons in the Geographic Information System database used for analysis of alternatives. They are typically subdivisions of the Forest Operations Inventory polygons, and are formed by the intersection and overlay of a variety of Geographie Information System layers or themes sueh as roads, streams, ete. (See Appendix Q - Vegetative Modeling for further information).

Planners examine the **sampled** (see below) WOPR ID units as these ID units are formed into logieal larger harvest units where the WOPR ID units are contiguous. Planners then use a variety of Geographic Information System themes sueh as elevation eontours, streams, ownership boundaries, etc. to ereate a "paper plan" for eaeh harvest unit.

Onee harvest units are determined, planners use loeal knowledge and the Geographie Information System theme layers to loeate and doeument the existing roads and new road eonstruction needed for aeeess, loeation of landings to be eonstrueted, and the harvest method (ground based, eable/skyline or helicopter) to be used.

Onee these Geographie Information System themes have been eompleted, the layers are assembled and are overlaid in order to perform operations to assemble the information at a variety of scales.

Sampling

Since the ten-year scenario is a simulation, these methods provide an estimate of such effects as miles of new road construction, acres of ground-based harvest, and number of new stream crossings.

In order to develop the estimates in a reasonable time and with a reasonable level of effort, a sampling method was developed to select a portion of the simulated units for analysis.

Sections where harvest occurs within the ten-year scenario are sampled at a 1 in 3 random sample. Results from this sampling are developed as ratios such as miles of new road construction per million board feet, by thinning or regeneration harvest. These ratios are then expanded to the entire population to yield estimates of the amount for the entire harvest over the 10 years.

Sampling a particular township, range, and section is not stratified. That is to say that all sections where at least one WOPR ID unit is harvested have an equal chance of being sampled independent of the size of harvest within that section and independent of the acres of BLM land within that section.

Although units are selected by section, examination of the results show that many metrics such as acres sampled or volume sampled are within a few percent of the expected values of 33 percent. Actual expansion is based upon the sampled volume level.

The ratios developed are split by district, alternative, harvest type (thinning/regeneration harvest), and road type (temporary/permanent and surfaced/natural). These ratios are then expanded to estimate the total miles of road by road and harvest type, the acres disturbed from construction, etc. Once these ratios are developed, they are prorated to other units for expansion.



Appendix E. Botany

This appendix provides a list of federally listed and candidate plant species and actions and plans related to federally listed and BLM special status plant species. It also includes a list of special status plants by habitat group. The analysis of effects for plant species is based on using these habitat groups.

In this appendix:

Federally Listed and Candidate Plant Species 975

Digest of Actions Contained in Individual Recovery Plans for Federally-Listed Plant Species 977

Digest of Conservation Plans for Special Status Plants 980

Habitat Groups 984

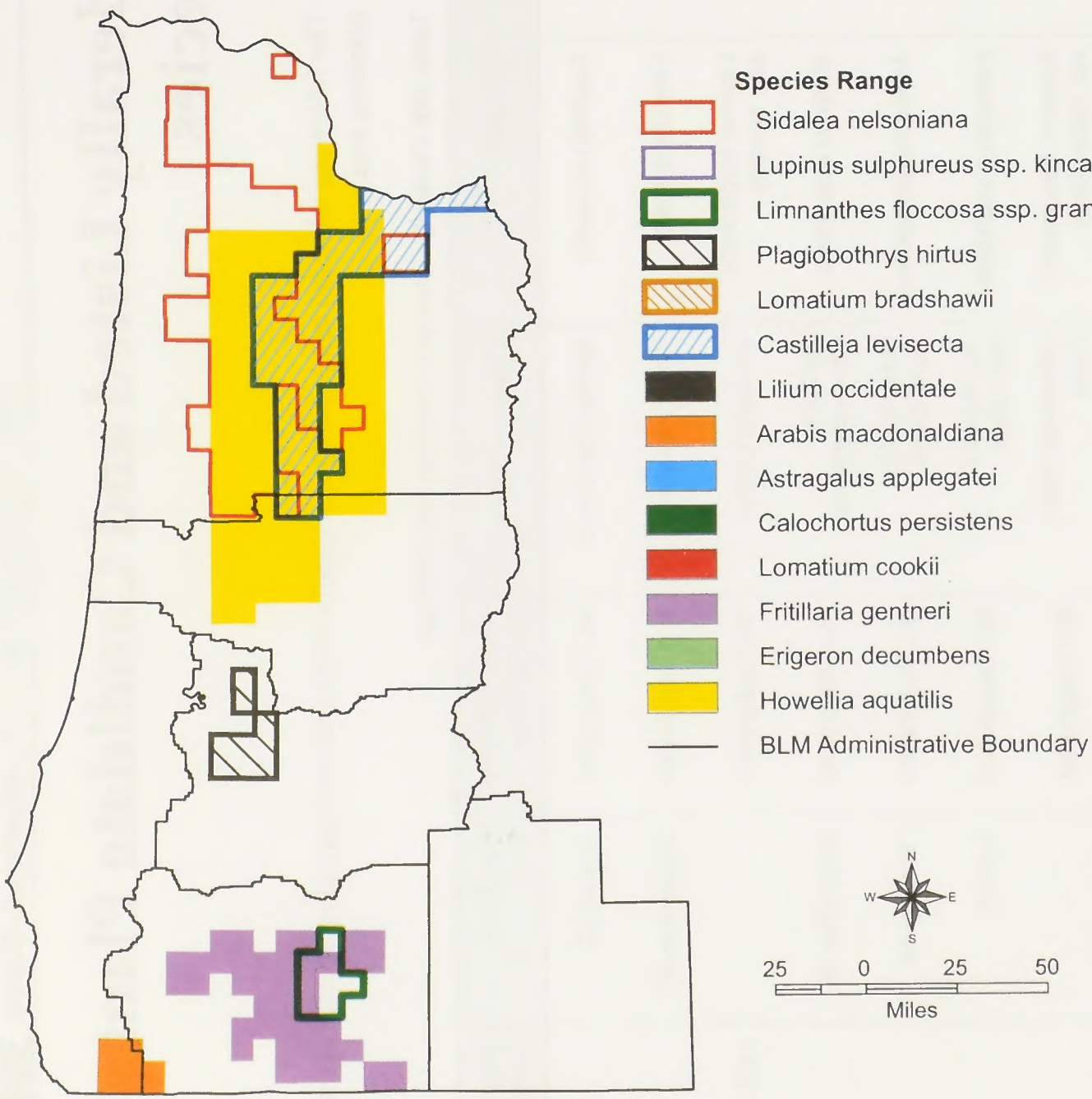
Federally Listed and Candidate Plant Species

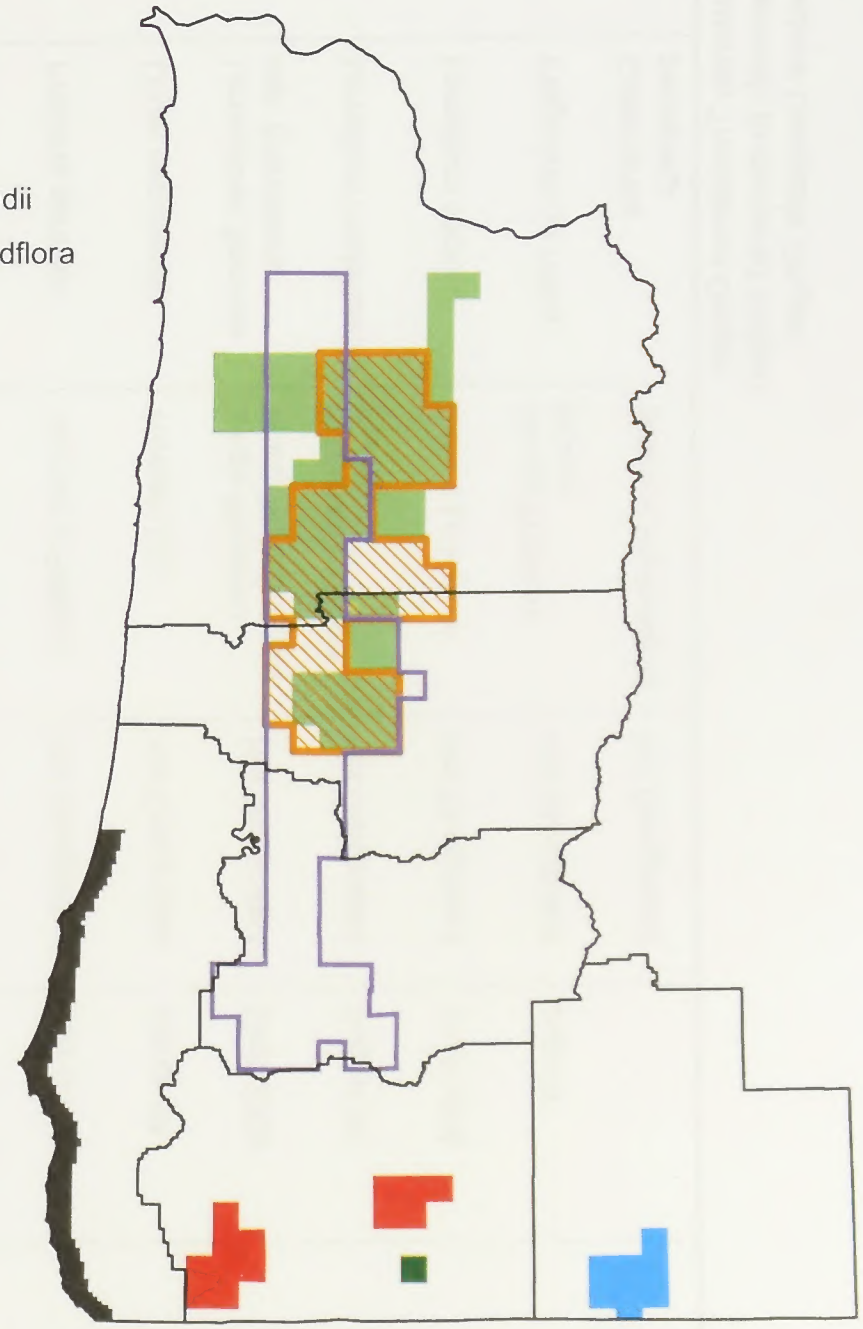
The following table and maps show the federally listed and candidate plant species in the planning area.

Table 239. Federally Listed and Candidate Plant Species

Federal Status	Species	Common Name	Critical Habitat Designation	Recovery Plan	Conservation Agreement
FTO	Castilleja levisecta	Golden Paintbrush	Not Designated	August-00	
FTO	Howellia aquatilis	Water Howellia	Not Designated	September-96	
FTO	Lupinus sulphureus ssp. kincaidii	Kincaid's Lupine	Not Designated		April-06
FTO	Sidalcea nelsoniana	Nelson's Checker-mallow	Not Designated	September-98	
FEO	Arabis macdonaldiana	MacDonald's Rock-Cress	Not Designated	February-84	
FEO	Astragalus applegate	Applegate's Milk-Vetch	Not Designated	April-98	
FEO	Erigeron decumbens var. decumbens	Willamette Valley Daisy	Not Designated		
FEO	Fritillaria gentneri	Gentner's Fritillary	Not Designated	July-03	
FEO	Lilium occidentale	Western Lily	Not Designated	March-98	
FEO	Limnanthes floccosa ssp. grandiflora	Large-Flowered Wooly Meadowfoam	Not Designated	Draft 2006	
FEO	Lomatium bradshawii	Bradshaw's Desert Parsley	Not Designated	August-93	
FEO	Lomatium cookii	Cook's Lomatium	Not Designated	Draft 2006	
FEO	Plagiobothrys hirtus	Rough Popcorn Flower	Not Designated	July-03	
FCO	Calochortus persistens	Siskiyou Mariposa lily	Not Designated		

FTO = Federally Threatened Oregon
FEO = Federally Endangered Oregon
FCO = Federal Candidate Oregon





Map 35. Federally Listed Plants

M06-12-02

Digest of Actions Contained in Individual Recovery Plans for Federally-Listed Plant Species

Recovery Plans for nine (9) federally-listed plant species have been completed and approved by the U.S. Fish and Wildlife Service. The individual recovery plans are incorporated by reference, and each stands on its own with a complete list of recovery actions.

The bulleted lists of conservation actions for each species are excerpts from the individual recovery plans. The key elements vary by species and by recovery plans, and are not intended to be a comprehensive list of all potential actions. Writing style and vocabulary differ as these recovery plans have been written by numerous authors over a period of 20 years.

Nelson's checker-mallow (Sidalcea nelsoniana) (USDI, USFWS 1998a)

- Establish reserves to manage for the recovery of the species;
- Actively manage habitat within reserves to achieve natural recruitment, population size and age structure;
- Manage reserves to maintain suitable habitat, to reduce succession and competition threats; and
- Augment populations, collect seed, and propagate seedlings.

Rough popcorn flower (Plagiobothrys hirtus) (USDI, USFWS 2003a)

- Conserve all existing populations and manage reserves within recovery areas for long-term viability of the species;
- Protect habitat within reserves including habitat for pollinators;
- Manage existing sites by reducing competition and impacts from native and non-native species; and
- Develop new populations in recovery units by planting or seeding areas.

Kincaid's lupine (Lupinus sulphureus spp. kincaidii) (Conservation Agreement applicable to the Roseburg District, BLM only) (USDI USFWS 2006a)

- Maintain stable populations by protecting and restoring habitat of each population;
- Maintain viable populations by reducing threats;
- Conserve a minimum of two meta-populations within the recovery zone in Douglas County;
- Conserve a minimum of 5,000 m2 of occupied habitat;
- Survey suitable habitat for new populations and manage habitat to meet recovery goals;
- Select, protect and manage reserve populations to address threats and increase the population; and
- Introduce and/or augment populations into suitable habitat.

Western lily (*Lilium occidentale*) (USDI, USFWS 1998b)

- Search for additional sites and potential suitable habitat;
- Protect all known populations;
- Establish, delineate and secure management areas that include all necessary habitat and plants to sustain a viable population;
- Manage sites to enhance the habitat so that existing populations will naturally increase. Remove over-topping vegetation;
- Reintroduce or augment populations as prudent; and
- Allow grazing with minimal negative effects to the lily, or suspend during the flowering and fruiting season as prudent.

Gentener's fritillary (*Fritillary gentneri*) (UDSI, USFWS 2003b)

- Establish 8 management areas within 4 recovery units to provide for long-term maintenance or improvement of habitat;
- Develop protection strategies to reduce successional encroachment and shading, curtail new roads in habitat, control and prevention of invasive weed colonization, reduction of herbivory by deer and livestock, prevention of public bulb collection;
- Augment populations as needed to meet recovery criteria;
- Collect and cultivate bulblets for augmentation within management areas; and
- Survey for undiscovered populations in suitable habitat.

Bradshaw's lomatium (*Lomatium bradshawii*) (UDSI, USFWS 2003c)

- Secure and manage habitat within 4 recovery areas;
- Establish 10 management areas, develop management plans, secure and protect the habitat supporting each population, and implement site specific plans;
- Enhance populations within management areas by reducing threats to the species. Manage secondary succession, habitat modification, competition from native and introduced species, removal of trees altering soil conditions, insect and fungal diseases, human impacts, herbicide impacts, and grazing impacts; and
- Locate additional sites by identifying potential habitat and conducting searches for additional populations.

McDonald's rock-cress (*Arabis mcdonaldiana*) (USDI, USFWS 1990)

- Protect and conserve all existing populations and habitat;
- Identify and protect essential habitat;
- Survey additional suitable habitat; and
- Withdraw lands from mining, designate as "special areas", and acquire suitable habitat where possible.

Golden paintbrush (*Castelleja levisecta*) (USDI, USFWS. 2000)

- Maintain the current geographic distribution of the species by maintaining habitat integrity;
- Implement habitat management that includes; protection of sites with the best potential for providing long-term stable habitat, and maintenance of unoccupied, potential habitat in suitable condition;
- Establish new populations within the historic range of the species;
- Conduct inventory surveys for undiscovered populations in suitable habitat; and
- Reintroduce populations into unoccupied habitat in its former range.

Applegate's milk-vetch (*Astaragalus applegate*) (USDI, USFWS 1998c)

- Conserve natural and introduced populations;
- Establish 6 recovery areas and develop management strategies for long-term stability;
- Manage the habitat of each population to achieve the desired population size and age structure, to encourage natural population recruitment and to minimize adverse impacts to populations;
- Inventory for undiscovered populations;
- Select population preservation and establishment sites;
- Secure extant populations and establishment sites; and
- Establish introduced populations and augment populations.

Water howellia (*Howellia aquatilis*) (USDI, USFWS 1996)

- Maintain the extant geographic range and habitat integrity that include the following key components; the maintenance of the natural vegetation, hydrologic, and geomorphologic conditions that determine the natural habitat succession rates and seasonal inundation and drying patterns of the habitat;
- Implement habitat management that will sustain occurrences and maintain habitat integrity to ensure functioning of meta-population dynamics;
- Provide protection on federal lands through special management designations such as Research Natural Areas or other designations;
- Conduct inventories in suitable habitat throughout the range of the species; and
- Develop and implement a reintroduction plan.

Digest of Conservation Plans for Special Status Plants

The lists below summarize the primary actions described in the agreements and strategies for Bureau sensitive species that would be applied on BLM managed lands. These lists are not intended to be complete and comprehensive. The conservation agreements and conservation strategies of each species are the documents that provide complete details and guide the management of the species.

Conservation Strategies

Gorman's Aster (*Aster gormanii*) (USDA, USDI 1994a)

- Maintain healthy reproductive populations at a variety of sites;
- Protect populations from immediate threats to their existence, such as: grazing by livestock or wildlife, habitat loss from timber harvest operations, road construction, and recreation; and
- Inventory suitable habitat of the species and collect baseline data on habitat requirements and vegetation community characteristics.

Silvery Phacelia (*Phacelia argentea*) (USDI, BLM, Coos Bay District 1995)

- Survey suitable habitat for new populations and update information of existing populations including threats and habitat;
- Improve occupied habitat and protect known populations from OHV use, European beachgrass infestation; and
- Collect seed for long term conservation.

Green Gentian (*Frasera umpquaensis*) (USDA, USDI 1993b)

- Ensure the continued viability of the species by designating all populations on BLM lands as critical to maintain viable, genetically stable populations;
- Protect populations from timber harvest operations, encroachment of trees into meadows, and fire suppression; and
- Field reconnaissance and survey for *F. umpquaensis* populations in potential habitat.

Columbia cress (*Rorippa columbiae*) (USDA, USDI 1996a)

- Employ one or more of the following actions to protect this species from livestock grazing and trampling: fence habitat and known populations, provide alternative water sources for cattle, alter grazing schedules to avoid the growing season of *R. columbiae* (April-October), and reduce or eliminate the number of livestock in the grazing unit;
- Allow higher water levels in early spring to reproduce the scouring effects of floods to help control the establishment of woody and weedy species.
- Provide populations with a 200-300 foot buffer near timber harvest sites;
- Install gates and signs to manage access by vehicles;
- Conduct inventory for potential habitat and undiscovered populations;

- Protect local hydrologic function by avoiding habitat changes when implementing erosion control, timber harvests and road construction projects; and
- Control competing herbaceous vegetation and invading tree species.

Tall Bugbane (*Cimicifuga elata*) (USDA, USDI 1996b)

- Selected sites will be managed to:
    - Maintain and enhance site viability.
    - Mitigate direct and indirect impacts, including: alterations in hydrology, canopy closure, changes in habitat from timber harvest, and road building in order to create and maintain conditions favorable for the C. elata.
- Management for non-selected populations is discretional;
- Improve the quality of existing habitat through broadcast burning and thinning to create and maintain forest gaps;
- Collect seeds and fruits for long term storage and potential future propagation;
- Install signs and protect populations within road right of ways. Restrict blading and ditching activities that would harm populations;
- Salvage plants for relocation when protection is not possible;
- Identify suitable habitat where reintroductions would benefit the species; and
- Inventory in suitable habitat.

Conservation Agreements

Large-flowered rush lily (*Hastingsia bracteosa),* Purple-flowered rush lily *(Hastingsia atropurpurea,* Mendocino gentian (*Gentiana setigera), Oregon willow-herb (Epilobium oreganum), and* Western bog violet (*Viola primulifolia ssp. occidentalis)* (USDA, USDI 2006)

- Provide conservation for five rare plant species and their serpentine wetland habitat, known as *Darlingtonia californica* fens;
- Inventory to identify new suitable and/or occupied habitat;
- Manage the *Darlingtonia* fens and protect their significant biological and ecological functions and values; and
- Protect *Darlingtonia* fens from threats such as: mining activities, road construction and maintenance, up slope logging, OHV use, fire suppression activities, water siphoning, over utilization for commercial, recreational, scientific or educational purposes, and from several invasive and noxious weed species.

Crinite Mariposa Lily (*Calochortus coxii*) (USDI, BLM and USFWS 2004f)

- Restore *Calochortus coxii* meadow habitat with native bunchgrasses and/or prescribe burn on a frequency matching natural fire return level. Thin or girdle trees to produce gaps in forest habitat;
- Inventory and control invasive and noxious weeds using integrated pest management (mechanical, manual, biological, and chemical methods);
- Exclude livestock inside habitat of *C. coxii; and*
- Collect seeds for long term conservation and propagation.

Umpqua Mariposa Lily *(Calochortus umpquaensis)* (USDA, USDI BLM and USFWS 1995)

- Acquire habitat on private lands to increase the amount of habitat in Federal ownership;
- Mitigate impacts from energy right of way and corridors;
- Manage livestock grazing and vehicle access inside habitat by installing gates and fences;
- Maintain and restore *Calochortus umpquaensis* meadow habitat with native bunchgrasses or other native species;
- Conduct prescribed burning and thinning to produce gaps in forest habitat; and
- Conduct inventories of potential habitat.

Habitat Groups

For the analysis of effects, special status plant species were categorized based on habitat relationships as shown in Table 240. A species can occur in more than one habitat group. Survey and Manage Species under No Action were also categorized by habitat and are shown in Table 241.

Habitat Groups and Abbreviations are as follows:

MG=Meadows/Grassland, SC=Shrub Community, OHW=Oak/Hardwood Woodlands, CF=Conifer/Mixed Evergreen Forest, SW=Seasonal Wetland Fends/Vernal Pools, RI=Riparian and Aquatic, SE=Serpentine Areas, RK=Rocky Areas Outcrops/Scree, MZ=Maritime Zone

Bureau Status and abbreviations are as follows:

SEO= State Endangered Oregon, STO=State Threatened Oregon, BAO=Bureau Assessment Oregon, BSO=Bureau Sensitive Oregon, FEO=Federally Endangered Oregon, FTO=Federally Threatened Oregon.

Taxon and abbreviations are as follows:

VA=Vascular, FU=Fungi, BR=Bryophyte, LI=Lichen

Table 240. Special Status Plant Species Habitat Groups

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
MZ	ABRONIA UMBELLATA SSP. BREVIFLORA	PINK SAND-VERBENA	SEO	VA	forb	Sandy areas, coastal dunes and scrub
CF, RK	ADIANTUM JORDANII*	CALIFORNIA MAIDEN-HAIR	BAO	VA	fern	Shaded seeps, hillsides, moist woods, rocky outcrops, vertical cliffs, forest openings, rocky banks in mists, in falls spray. Suspected – only a historic site on the UW RA.
MG	AGOSERIS ELATA	TALL AGOSERIS	BAO	VA	forb	Meadows, shrubby slopes and open woodlands to mid elevation. 1200 ft near Roseburg
MG	AGROSTIS HENDERSONII	HENDERSON'S BENTGRASS	BSO	VA	graminoid	Vernal pools
RK	AGROSTIS HOWELLII*	HOWELL'S BENTGRASS	BSO	VA	graminoid	moist cliffs, Columbia Gorge
MZ, CF	ALBATRELLUS AVELLANEUS		BSO	FU	FUNGUS	Terrestrial in chaparell, hardwood and conifer habitat, mycorrhizal with pines
SE	ALLIUM PENINSULARE	PENINSULAR ONION	BAO	VA	forb	dry slopes and flats
CF	ALPOVA ALEXSMITHII		BSO	FU	FUNGUS	buried in humus soil, near alders
RI, RK	ANDREAEA SCHOFIELDIANA		BAO	BR	MOSS	acidic rock, granite
MG	ANDROSACE ELONGATA SSP. ACUTA	LONG-STEMMED ANDROSACE	BAO	VA	forb	dry grassy slopes
MG	ANEMONE OREGANA VAR. FELIX	BOG ANEMONE	BAO	VA	forb	bogs in shady woods
RK	ARABIS KOEHLERI VAR. KOEHLERI*	KOEHLER'S ROCKCRESS	BSO	VA	subshrub	Dry, rocky cliffs
SE,RK	ARABIS MACDONALDIANA	MACDONALD'S ROCK-CRESS	FEO	VA	forb	Serpentine or granitic slopes ridges and rock outcrops, crevices and openings in Jeffery pine forests
SE,RK	ARABIS MODESTA	ROGUE CANYON ROCKCRESS	BAO	VA	forb	Serpentine soils, deep soil on steep slopes, cliffs, shaded canyon ledges
RK	ARABIS SPARSIFLORA VAR. ATRORUBENS	SICKLE-POD ROCKCRESS	BAO	VA	forb	Rocky slopes, valleys

* Species with 20 or fewer populations

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
RK	ARABIS SUFFRUTESCENS VAR. HORIZONTALIS	CRATER LAKE ROCKCRESS	BSO	VA	subshrub	Gravelly or stony slopes, dry pumice
CF	ARCANGELIELLA CAMPHORATA*		BSO	FU	FUNGUS	in duff under conifers and mixed hardwoods
SE,SC	ARCTOSTAPHYLOS HISPIDULA	HAIRY MANZANITA	BAO	VA	shrub	Rocky serpentine soils or sandstone, open shrub and forests, not fire tolerant
RK	ARNICA VISCOSA	SHASTA ARNICA	BAO	VA	subshrub	Open, rocky, subalpine to alpine sites
MZ	ARTEMISIA PYCNOCEPHALA	COASTAL SAGEWORT	BAO	VA	forb	Rocky or sandy soils, coastal strand
CF	ASARUM WAGNERI	GREEN-FLOWERED WILD-GINGER	BSO	VA	forb	Open boulder fields under White-fir/Red fir conifer stands near Mt McGlofflin at timberline,
RK	ASPLENIUM SEPTENTRIONALE	GRASS-FERN	BAO	VA	Spleen wort	Crevices of granite rocks
CF	ASTER BREWERI	BREWER'S ASTER	BAO	VA	subshrub	Subalpine meadows, open woods
MG,SW	ASTER CURTUS (Sericocarpus rigidus)	WHITE-TOPPED ASTER	STO	VA	forb	wet prairies, low elevations (humid and arid tranzition zone - Abrams)
RK	ASTER GORMANII	GORMAN'S ASTER	BSO	VA	forb	dry, rocky slopes, boreal zone
SW	ASTRAGALUS APPLEGATEI	APPLEGATE'S MILK-VETCH	FEO/ SEO	VA	forb	Moist meadows,
MG	ASTRAGALUS CALIFORNICUS	CALIFORNIA MILK-VETCH	BAO	VA	forb	Dry, open areas in scrub, woodland
RK	ASTRAGALUS PECKII	PECK'S MILK-VETCH	STO	VA	forb	dry, sandy ground
RI	BACCHARIS DOUGLASII	MARSH BACCHARIS	BAO	VA	forb	Moist salt marshes, stream edges
MG	BALSAMORHIZA HOOKERI VAR. LANATA	WOOLLY BALSAMROOT	BSO	VA	forb	Open woods, grassy slopes
SW,RI, CF	BENSONIELLA OREGANA	BENSONIA	BSO	VA	forb	Wet meadows, bogs and streams in deep soils under conifer forests
RK	BOLANDRA OREGANA	OREGON BOLANDRA	BSO	VA	subshrub	Near streams and moist rock crevices, wet cliffs in deep shade to open areas, lower Columbia river gorge
CF	BOLETUS PULCHERRIMUS		BSO	FU	FUNGUS	mixed woods and conifers

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
CF	BOTRYCHIUM MONTANUM	MOUNTAIN GRAPE-FERN	BAO	VA	grape-fern	Shady coniferous forests, edges of bogs, cedar swamps
RK	BOTRYCHIUM PUMICOLA	PUMICE GRAPE-FERN	STO	VA	grape-fern	fine pumice gravel on open slopes,dense lodgepole pine stands, high elevation
RK	BRACHYDONTIUM OLYMPICUM		BAO	BR	MOSS	rock, tiny
CF	BRIDGEOPORUS NOBILISSIMUS		BSO	FU	FUNGUS	conifer forests, true firs, Silver fir zone
MZ	BRODIAEA TERRESTRIS	DWARF BRODIAEA	BAO	VA	forb	Grassland, open woodlands
SW	BRUCHIA FLEXUOSA		BAO	BR	MOSS	Wet prairie habitat, mud flats around reservoir, low elevation grasslands
MZ, CF	BRYORIA PSEUDOCAPILLARIS		BSO	LI	Lichen	Picea sitchensis forests, exposed sites along the immediate coast, canopy, bark and wood,
MZ, CF	BRYORIA SPIRALIFERA		BSO	LI	Lichen	mostly conifers but also hardwoods, canopy, bark and wood, spiralling around branches, within 2 miles of coast
MZ, CF	BRYORIA SUBCANA*		BAO	LI	Lichen	Picea sitchensis forests,mostly conifers but also hardwoods and shrubs, canopy, bark and wood, spiralling around branches, along coastal bays and streams, ridges and summits in CA
RI,RK	BRYUM CALOBRYOIDES*		BAO	BR	MOSS	montane to alpine elevations in the Coast Ranges and the Rocky Mountains
SW	BULBOSTYLIS CAPILLARIS	SAND SEDGE	BAO	VA	forb	Meadows, grassy clearings
RI	CALAMAGROSTIS BREWERI	BREWER'S REEDGRASS	BAO	VA	grass	Moist subalpine and alpine meadows, lake margins, streambanks
CF	CALICIUM ADSPERSUM		BAO	LI	Lichen	Highly textured bark on the boles of old growth conifer trees
SW	CALLIERGON TRIFARIUM		BAO	BR	MOSS	wetland sites, bogs and fens

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
SE,MG, CF	CALOCHORTUS COXII*	CRINITE MARIPOSA-LILY	SEO	VA	forb	ultramafic slopes, open woodlands
SC,MG	CALOCHORTUS GREENEI	GREENE'S MARIPOSA-LILY	BSO	VA	forb	Dry rocky hillsides, bluffs and flats in openings and margins of shrubs and conifer woodlands
SE	CALOCHORTUS HOWELLII	HOWELL'S MARIPOSA-LILY	STO	VA	forb	ultrmafic soils in meadows, open woodlands
SE	CALOCHORTUS INDECORUS	SEXTON MT. MARIPOSA-LILY	SEO	VA	forb	ultramafics, open slopes,
RK,MG	CALOCHORTUS MONOPHYLLUS*	ONE-LEAVED MARIPOSA-LILY	BAO	VA	forb	Wooded slopes, clay-loam soils
RK	CALOCHORTUS NITIDUS*	BROAD-FRUIT MARIPOSA-LILY	BAO	VA	forb	grasslands and meadows
RK	CALOCHORTUS PERSISTENS*	SISKIYOU MARIPOSA-LILY	FCO	VA	forb	Open, dry rocky ridgetops
SE,MG, CF	CALOCHORTUS UMPQUAENSIS	UMPQUA MARIPOSA-LILY	SEO	VA	forb	open forests and grasslands
RI, SW	CALYPOGEIA SPHAGNICOLA		BAO	BR	LIVER-WORT	Wetland bogs containing sphagnum
MG,SE	CAMASSIA HOWELLII	HOWELL'S CAMAS	BSO	VA	forb	serpentine slopes, open woodlands
OHW,MG	CAMISSONIA GRACILIFLORA	SLENDER-FLOWERED EVENING-PRIMROSE	BAO	VA	forb	Open or shrubby slopes, generally clay soils, grasslands, oak woodlands
MZ, RI	CAMPYLOPUS SCHMIDII*		BAO	BR	MOSS	Wetlands along the coast, In partially-stabilized coastal sand dunes w/in one mile of ocean. In open stands of shore pine, cedar & cypress; shaded to exposed sand around the edges of vernal pools, and in deflation plains
RK	CARDAMINE PATTERSONII	SADDLE MOUNTAIN BITTERCRESS	BSO	VA	forb	Moist, mossy rocks, cliffs, open slopes with shallow soil.
RI	CAREX ABRUPTA	ABRUPT-BEAKED SEDGE	BAO	VA	sedge	Generally moist meadows, open forest
MZ, RI	CAREX BREVICAULIS	SHORT STEMMED SEDGE	BAO	VA	sedge	Rocky or sandy soil; sand dunes in Festuca rubra community; coastal
RI	CAREX BRUNNESCENS SSP. BRUNNESCENS	BROWNISH SEDGE	BAO	VA	sedge	wet places, banks and open woods

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
RI	CAREX CAPITATA	CAPITATE SEDGE	BAO	VA	sedge	Generally wet places
RI,SW	CAREX COMOSA	BRISTLY SEDGE	BAO	VA	sedge	Marshes, lakeshores and wet meadows
MZ, RI	CAREX CRAWFORDII	CRAWFORD'S SEDGE	BAO	VA	sedge	open places
RI	CAREX DIANDRA	LESSER PANICLED SEDGE	BAO	VA	sedge	Marshy meadows
RI, MG, CF, SW	CAREX GYNODYNAMA	HAIRY SEDGE	BAO	VA	sedge	Wet meadows; open forests; <600m
RI	CAREX LASIOCARPA VAR. AMERICANA	SLENDER SEDGE	BAO	VA	sedge	Lake, pond shores, generally in standing water
RI	CAREX LIVIDA	PALE SEDGE	BAO	VA	sedge	Bogs, swampy woods, OR coast and Cascades, extirpated in CA
RI	CAREX RETRORSA	RETRORSE SEDGE	BAO	VA	sedge	Edges of sloughs and lakes, swamps, bogs, wet meadows; in foothills and lowlands
SE, RI, SW	CAREX SCABRIUSCULA	SISKIYOU SEDGE	BAO	VA	sedge	marshy meadows, swamps, bogs, moist rocky slopes
OHW, SW, RI	CAREX SERRATODENS	SAW-TOOTH SEDGE	BAO	VA	sedge	Moist places
SW,RI	CAREX SP. NOV.	A SEDGE	BSO	VA	sedge	
CF	CASTILLEJA CHLOROTICA	GREEN-TINGED PAINTBRUSH	BSO	VA	forb	
SW, MG	CASTILLEJA LEVISECTA	GOLDEN PAINTBRUSH	FTO/ SEO	VA	forb	lowland meadows and along water
MZ, SC	CASTILLEJA MENDOCINENSIS	MENDOCINO COAST INDIAN PAINTBRUSH	BSO	VA	forb	coastal bluffs, coastal praire, scrub and conifer forests
RK	CASTILLEJA RUPICOLA	CLIFF PAINTBRUSH	BAO	VA	forb	rock cliffs in Cascades
RI	CERATOPHYLLUM ECHINATUM	PRICKLY HORNWORT	BAO	VA	aquatic forb	Lakes, ponds, marshes. More acidic and oligotrophic water than common hornwort.
RK	CHEILANTHES COVILLEI	COVILLE'S LIP-FERN	BAO	VA	fern	Crevices, bases of rocks, sun or shade
RK	CHEILANTHES INTERTEXTA	COASTAL LIPFERN	BAO	VA	fern	Crevices, bases of rocks
RI	CHILOSCYPHUS GEMMIPARUS		BSO	BR	LIVER-WORT	Attached to rocks in the bed of cold water streams, submerged or emergent in the splash zone (known from 2 localities in OR)

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
OHW	CHLOROGALUM ANGUSTIFOLIUM*	NARROW-LEAVED AMOLE	BAO	VA	forb	Heavy soils of grassland or woodland
RI, OHW, SW,MG, RK	CICENDIA QUADRANGULARIS*	TIMWORT	BAO	VA	forb	Crevices, bases of rocks, coastal wetlands, vernal pools, moist valley grasslands and oak woodland
RI	CICUTA BULBIFERA	BULB-BEARING WATER-HEMLOCK	BAO	VA	forb	marshes and lake borders
CF	CIMICIFUGA ELATA	TALL BUGBANE	BSO	VA	forb	Moist shady woods, open canopy, at lower elevations, often with big leaf maple in overstory, always dominant swordfern ground cover; north to northeast-facing steep slopes; mid-slope: near creeks
OHW,MG	CIRSIUM CILIOLATUM	ASHLAND THISTLE	BSO	VA	forb	Open woodland
MZ, RK	CLADIDIUM BOLANDERI		BAO	LI	Lichen	Crustose microlichen, rock outcrops in coastal prairies, Bodega Bay, CA
OHW	CLARKIA HETERANDRA	SMALL-FRUIT CLARKIA	BAO	VA	forb	Shady sites, woodland, yellow-pine forest
MZ	COCHLEARIA OFFICINALIS	SPOONWORT	BAO	VA	forb, maritime succulent	Open woodland, coastal headlands and offshore rocks
CF,RI, MG	COLLOMIA MAZAMA	MT. MAZAMA COLLOMIA	BSO	VA	forb	open forests, rock outcrops
RI, CF	COPTIS TRIFOLIA	THREE-LEAF GOLDTHREAD	BAO	VA	forb	cool, moist conifer forests
RI	CORDYLANTHUS MARITIMUS SSP. PALUSTRIS	POINT REYES BIRD'S BEAK	SEO	VA	forb	Coastal salt marshes
RI, CF	CORYDALIS AQUAE-GELIDAE	COLD-WATER CORYDALIS	BSO	VA	aquatic forb	margins of springs, streams and gravel bars, gravel substrate, riparian, intermediate canopy closure
RI,RK	CRUMIA LATIFOLIA		BAO	BR	MOSS	On wet rocks and cliff faces, riparian, often on calcareous substrates. May be submerged in streams.
MZ	CRYPTANTHA LEIOCARPA	SEASIDE CRYPTANTHA	BAO	VA	forb	Stabile and shifting sand dunes

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RK	CRYPTANTHA MILO-BAKERI	MILO BAKER'S CRYPTANTHA	BAO	VA	forb	Rocky or gravelly soils, generally coniferous forest
RK	CRYPTOGRAMMA STELLERI	STELLER'S ROCK-BRAKE	BAO	VA	fern	moist shaded cliffs, mid to upper montane
CF	CRYPTOMITRIUM TENERUM		BAO	BR	LIVER-WORT	Partly shady slope with Lithocarpus and Umbrellularia on soil in trail cut. Abundant with capsules.
CF	CUPRESSUS BAKERI*	BAKER'S CYPRESS	BAO	VA	tree	Mixed-evergreen forests, open slopes, flats, basalt or serpentine
RI	CYPERUS ACUMINATUS	SHORT-POINTED CYPERUS	BAO	VA	forb	Wet,low places in valley and lowlands, edges of temporary pools, ponds, streams, ditches
CF	CYPRIPEDIUM FASCICULATUM	CLUSTERED LADY'S-SLIPPER	BSO	VA	forb	Open coniferous forest
MG, RK	DELPHINIUM LEUCOPHAEUM	WHITE ROCK LARKSPUR	SEO	VA	forb	low, moist meadows, rocky banks
RK,CF, OHW	DELPHINIUM NUDICAULE	RED LARKSPUR	BAO	VA	forb	Common. Moist talus, wooded, rocky slopes:
RI, MG	DELPHINIUM NUTTALLII	NUTALL'S LARKSPUR	BAO	VA	forb	low, moist meadows
MG, OHW	DELPHINIUM OREGANUM	WILLAMETTE VALLEY LARKSPUR	BSO	VA	forb	open plains and hillsides
OHW	DELPHINIUM PAVONACEUM	PEACOCK LARKSPUR	SEO	VA	forb	meadows
MZ, CF	DERMOCYBE HUMBOLDTENSIS*		BSO	FU	FUNGUS	on ground under conifers, particularly pines
CF	DESTUNTZIA RUBRA		BSO	FU	FUNGUS	buried in soil or duff in mixed woods or conifers, favors Doug-fir
RK	DICENTRA PAUCIFLORA	FEW-FLOWERED BLEEDINGHEART	BAO	VA	forb	Gravelly areas, high elevation coastal range
RI,CF	DIPLOPHYLLUM PLICATUM		BAO	BR	LIVER-WORT	Cool, moist habitats, decayed wood, downed logs, trunks, soil and rocks, moist shaded cliffs, along rivers and stream banks
RI, CF	DODECATHEON AUSTROFRIGIDUM*	FRIGID SHOOTINGSTAR	BSO	VA	forb	open or shaded vernally moist areas, cliffs or rock slopes

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RK	DRABA HOWELLII	HOWELL'S WHITLOW-GRASS	BSO	VA	forb	Rock crevices
RI	ELEOCHARIS PARVULA	SMALL SPIKERUSH	BAO	VA	forb	Wet saline or alkaline sites; marshes. Coastal in OR, including deflation plains.
RI	ENCALYPTA BREVICOLLA VAR. CRUMIANA		BSO	BR	MOSS	exposed rocky areas , cost range, high elevation
MG, RI, OHW	ENTOSTHODON FASCICULARIS*		BAO	BR	MOSS	growing on rock outcrops, soil, dry,open habitats
SW	EPILOBIUM OREGANUM	OREGON WILLOW-HERB	BSO	VA	forb	Ultramafics, wet meadows, bogs, small streams, ditches, full sun or part shade
OHW, SC	ERICAMERIA ARBORESCENS	GOLDEN FLEECE	BAO	VA	shrub	Foothill woodland and chaparral
SE, MG, RK	ERIGERON CERVINUS	SISKIYOU DAISY	BAO	VA	forb	Open, rocky slopes, meadows, pine to fir woods and serpentine areas
MG, OHW, SW	ERIGERON DECUMBENS VAR. DECUMBENS	WILLAMETTE VALLEY DAISY	FEO/ SEO	VA	forb	Woodland, open forest
RK, MG	ERIGERON HOWELLII	HOWELL'S DAISY	BSO	VA	forb	moist often rocky places
RI, MG	ERIGERON PEREGRINUS VAR. PEREGRINUS	WANDERING DAISY	BAO	VA	forb	moist meadow, streamsides or bogs in mts
MZ, CF	ERIODERMA SOREDIATUM*		BAO	LI	Lichen	costal fog zone, bark or wood of hardwoods and conifers
RK	ERIOGONUM LOBBII	LOBB'S BUCKWHEAT	BAO	VA	forb	Common. Open, rocky slopes and ridges
MG	ERIOGONUM UMBELLATUM VAR. GLABERRIMUM	GREEN BUCKWHEAT	BSO	VA	forb	Sand or gravel
RI	ERIOPHORUM CHAMISSONIS	RUSSET COTTON-GRASS	BAO	VA	sedge	Bogs, swamps and wet places. Open, rocky slopes and ridges, also coastal bogs
MG	ERODIUM MACROPHYLLUM	LARGE-LEAVED FILAREE	BAO	VA	forb	Open sites, grassland, scrub
SW	ERYNGIUM ALISMIFOLIUM	INLAND COYOTE-THISTLE	BAO	VA	forb	Vernal pools, flooded meadows
MZ	ERYSIMUM MENZIESII SSP. CONCINNUM	PACIFIC WALLFLOWER	BAO	VA	forb	Open sites, grassland, scrub, coastal bluffs, headlands, and cliffs

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MG, CF, RK	ERYTHRONIUM ELEGANS	COAST RANGE FAWN-LILY	STO	VA	forb	Northern Coast Range in Oregon, in open meadows, rocky cliffs, brushland, edges of sphagnum bogs (Grenier 1991).old & second growth conifer & hardwood forests w/ open canopies; also in shaded woods where plants smaller and may not flower; forest edges, roadsides; south facing dry sites w/ poison oak
SE,CF	ERYTHRONIUM HOWELLII	HOWELL'S ADDER'S-TONGUE	BSO	VA	forb	serpentine influence, meadows open woodlands, mixed evergreen
RK,MG	ESCHSCHOLZIA CAESPITOSA*	GOLD POPPY	BAO	VA	forb	Open chaparral, rocky slopes
CF, ME, MG, OHW	EUCEPHALUS VIALIS	WAYSIDE ASTER	STO	VA	forb	rocky hilsides, open woodland, chaparrel
RI	EUCLADIUM VERTICILLATUM		BAO	BR	MOSS	seeps and springs, high calcareous or alkaline, areas of tufa precipitation
OHW, MG	FESTUCA ELMERI	ELMER'S FECSUE	BAO	VA	grass	Moist, wooded slopes, under trees in rich soil
RI, CF	FILIPENDULA OCCIDENTALIS	QUEEN-OF-THE-FOREST	BSO	VA	forb	Riparian along streams
MG,CF	FRASERA UMPQUAENSIS	UMPQUA SWERTIA	BSO	VA	forb	open woodlands, meadows in mid to upper elevations
MG, RI	FRITILLARIA CAMSCHATCENSIS	INDIAN RICE	BAO	VA	forb	moist areas, tideflats to mt meadows
OHW,MG, SC,CF	FRITILLARIA GENTNERI	GENTNER'S FRITILLARY	FEO/ SEO	VA	forb	open woods and thickets
SE, RK	FRITILLARIA GLAUCA	SISKIYOU FRITILLARIA	BAO	VA	forb	Serpentine, rocky dry ridges and slopes
RK	FRITILLARIA PURDYI	PURDY'S FRITILLARY	BAO	VA	forb	Serpentine, rocky dry ridges and slopes
CH,RK, MG, SC	FUNARIA MUHLENBERGII		BAO	BR	MOSS	rock outcrops, open canopy Medford Dist, desert areas
CF	GASTROBOLETUS IMBELLUS		BSO	FU	FUNGUS	buried in soil or duff in mixed woods or conifers
SW	GENTIANA NEWBERRYI	NEWBERRY'S GENTIAN	BAO	VA	forb	MT meadows, banks, sub-alpine

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SW	GENTIANA PLURISETOSA	ELEGANT GENTIAN	BSO	VA	forb	UNCOMMON. Wet mtn meadows
SW	GENTIANA SETIGERA	WALDO GENTIAN	BSO	VA	forb	Wet mtn meadows and bogs, sometimes scree
MZ	GILIA MILLEFOLIATA	SEASIDE GILIA	BSO	VA	forb	Stabilized or shifting coastal dunes
CF	GYMNOMYCES NONDISTINCTA		BSO	FU	FUNGUS	buried in soil or duff in conifers stands
MG	HACKELIA BELLA	BEAUTIFUL STICKSEED	BAO	VA	forb	Streambanks, roadsides, forest openings
SW	HASTINGSIA BRACTEOSA VAR. ATROPURPUREA	PURPLE-FLOWERED RUSH-LILY	BSO	VA	forb	Serpentine mountain meadows and springs
SW	HASTINGSIA BRACTEOSA VAR. BRACTEOSA	LARGE-FLOWERED RUSH-LILY	STO	VA	forb	Serpentine mountain meadows and springs
SW	HELIOTROPIUM CURASSAVICUM	SALT HELIOTROPE	BAO	VA	forb	Moist to dry, saline soils
SW	HELODIUM BLANDOWII		BAO	BR	MOSS	bogs and fens
RK	HERBERTUS ADUNCUS		BAO	BR	LIVER-WORT	wet shady cliffs and bark of trees, basalt outcrops
RI	HERBERTUS SAKURAII		BAO	BR	LIVER-WORT	shaded cliffs
MZ, CF	HETERODERMIA LEUCOMELOS		BAO	LI	Lichen	coast fog zone, on conifers hardwoods and occasionaly rock
CF	HETERODERMIA SITCHENSIS		BAO	LI	Lichen	immediat coast
MG	HORKELIA CONGESTA SSP. CONGESTA	SHAGGY HORKELIA	BSO	VA	forb	Vernally moist,sparsly wooded areas, meadows and grasslands on rocky clay, generally ultramafic
OHW	HORKELIA TRIDENTATA SSP. TRIDENTATA	THREE-TOOTHED HORKELIA	BAO	VA	forb	Granitic or volcanic soils
RI	HOWELLIA AQUATILIS	WATER HOWELLIA	FTO	VA	aquatic forb	In stagnant ponds and sloughs.
MZ, RI	HYDROCOTYLE VERTICILLATA	WHORLED MARSH-PENNYWORT	BAO	VA	forb	Along edges of coastal and inland lakes ongranitic or volcanic soils, swampy ground, wetlands
MZ, CF	HYPOGYMNIA PULVERATA		BAO	LI	Lichen	coastal OR

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MZ, CF	HYPOGYMNIA SUBPHYSODES		BAO	LI	Lichen	Shore pine forest on Oregon coast, only known location
CF, MZ	HYPOTRACHYNA REVOLUTA		BAO	LI	Lichen	coastal, on trees and rocks, Cascades in WA, near Seattle.
CF,SC	ILIAMNA BAKERI	BAKER'S GLOBE-MALLOW	BSO	VA	forb	UNCOMMON. Mtn slopes, pine forests, juniper woodland, lava beds
CF,RI	ILIAMNA LATIBRACTEATA	CALIFORNIA GLOBE-MALLOW	BAO	VA	forb	Moist ground and stream sides in conifer forests, often on shady, disturbed ground
CF	IWATSUKIELLA LEUCOTRICHA		BAO	BR	MOSS	conifer tree trunks on fog drenched ridges
RI	JAMESONIELLA AUTUMNALIS VAR. HETEROSTIPA		BSO	BR	LIVER-WORT	Apparently an obligate aquatic, on stones, in moving water or in deep, ultra-oligotrophic lakes, bottom of Waldo Lake OR
RK	KALMIOPSIS FRAGRANS	FRAGRANT KALMIOPSIS - (DOUGLAS CO. POP.)	BSO	VA	forb	
CF	KECKIELLA LEMMONII	BUSH BEARDTONGUE	BAO	VA	subshrub or shrub	Rocky slopes, coniferous and mixed forests, chaparral
RI	KURZIA MAKINOANA*		BAO	BR	LIVER-WORT	in forests, rocky cliffs and ledges, shaded moist sites,bogs
MZ	LASTHENIA MACRANTHA SSP. PRISCA	LARGE-FLOWERED GOLDFIELDS	BSO	VA	forb	Coastal headlands
OHW,CF MG	LATHYRUS HOLOCHLORUS	THIN-LEAVED PEAVINE	BSO	VA	forb	open forests and thickets, margins of woods; roadsides, fencerows and near farmlands
CF, MZ	LEIODERMA SOREDIATUM		BAO	LI	Lichen	coastal fog zone, stabilized dunes in old Picea sitchensis and Pinus contorta forests, stems of hardwoods and conifers, semi-open habitat, dune woodlands
MZ, CF	LEPTOGIUM BREBISSONII		BAO	LI	Lichen	costal fog zone, bark or wood of hardwoods and conifers

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CF	LEUCOTHOE DAVISIAE	SIERRA LAUREL	BAO	VA	shrub, small tree	Uncommon. Bogs, wet areas
RK	LEWISIA COLUMBIANA VAR. COLUMBIANA	COLUMBIA LEWISIA	BAO	VA	forb	Granite slopes, cliffs
RK	LEWISIA COTYLEDON VAR. PURDYI	PURDY'S LEWISIA	BSO	VA	forb	Granitic or serpentine rock outcrops, sun or shade, oak or pine forests
CF	LILIUM KELLOGGII	KELLOGG'S LILY	BAO	VA	forb	Gaps and roadsides in conifer forest
MZ	LILIUM OCCIDENTALE	WESTERN LILY	FEO/ SEO	VA	forb	Coastal bogs and marshes, scrub near cost
MZ, RI, CF	LIMBELLA FRYEI		BSO	BR	MOSS	On wet, rotten wood, leaf litter and lower trunks of tall shrubs in dense coastal shrub swamps, wetland site, coastal OR,
SW	LIMNANTHES FLOCCOSA SSP. BELLINGERIANA	BELLINGER'S MEADOW-FOAM	BSO	VA	forb	vernal pools, seasonaly wet rocky areas and meadows, volcanic origin
SW	LIMNANTHES FLOCCOSA SSP. GRANDIFLORA	LARGE-FLOWERED WOOLY MEADOWFOAM	FEO/ SEO	VA	forb	seasonaly wet meadows, open areas, local endemic, Upper and Lower Taqble Rock Medford
SW	LIMNANTHES FLOCCOSA SSP. PUMILA*	DWARF MEADOW-FOAM	STO	VA	forb	edges of deep vernal pools and wet meadows, open areas, local endemic, summits of Upper and Lower Taqble Rock Medford
SW	LIMNANTHES GRACILIS SSP. GRACILIS	SLENDER MEADOW-FOAM	BSO	VA	forb	seasonaly wet meadows, open areas, serpentine
RI	LIMONIUM CALIFORNICUM	WESTERN MARSH-ROSEMARY	BAO	VA	forb	coastal salt marshes
RI	LIPOCARPHA MICRANTHA	SMALL-FLOWERED LIPOCARPHA	BAO	VA	sedge	Beaches, sand bars, wet bottomlands.
CF, RK	LOBARIA LINITA		BAO	LI	Lichen	trees, shrubs, mossy rocks, alpine sod, montane (var. linita is arctic, alpine, and montane rock outcrops; sterile. Var. tenuior is epiphytic, higher elevation old growth stands; apotheciate.)

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MG, SW	LOMATIUM BRADSHAWII	BRADSHAW'S DESERTPARSLEY	FEO/ SEO	VA	forb	Wet prairies; grassy swales; along waterways at low elevations in areas that are seasonally wet and void of shrubs and trees
MG,OHW	LOMATIUM COOKII	COOK'S LOMATIUM	FEO/ SEO	VA	forb	open valley bottomlands and woodlands, local endemic
SE	LOMATIUM ENGELMANNII*	ENGLEMANN'S DESERT-PARSLEY	BAO	VA	forb	Gravelly slopes in coniferous forest
MZ, SW, RI	LOPHOZIA LAXA		BAO	BR	LIVER-WORT	growing among and over branches of sphagnum in well-developed peatlands, coastal areas and in Cascade Mts.
CF/RI	LOTUS STIPULARIS*	STIPULED TREFOIL	BAO	VA	forb	Open pine forests, streambeds, ditches, thickets, chaparral, logged areas
CF	LUPINUS BREWERI VAR. BREWERI	BREWER'S LUPINE	BAO	VA	forb	Common. Generally open montane forest
MG, OHW, CF	LUPINUS SULPHUREUS SSP. KINCAIDII	KINCAID'S LUPINE	FTO/ STO	VA	forb	Open montane forest, dry, open woods, valley prairie grasslands, oak forests, often in sandy soil
CF	LUPINUS TRACYI	TRACY'S LUPINE	BAO	VA	forb	UNCOMMON. Dry, open montane forest
RI	LUZULA ARCUATA SSP. UNALASCHCENSIS	ALASKA CURVED WOODRUSH	BAO	VA	forb	Mossy banks, boggy shores, rocky areas. At 3000', Hood River Co., also reported 1000-1600' Douglas Co. (rocky rideges, high elevation, glacial moraines, Peck)
MZ, RI	LYCOPODIELLA INUNDATA	BOG CLUB-MOSS	BAO	VA	CLUB-MOSS	Coastal wetlands, moist areas in lake and pond margins, muddy depressions, peat bogs, fends, edge, and coastal habitats
CF	LYCOPODIUM COMPLANATUM	GROUND CEDAR	BAO	VA	forb	in woods and thickets
CF	MARTELLIA IDAHOENSIS		BSO	FU	FUNGUS	buried in soil or duff in conifers stands
OHW, MG, SW	MECONELLA OREGANA*	WHITE FAIRYPOPPY	BSO	VA	forb	Open ground, moist, sandy, gravelly areas

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MG	MEESIA ULIGINOSA*		BAO	BR	MOSS	wetland sites, often bogs and fens
RK	MELICA STRICTA	NODDING MELIC	BAO	VA	forb	Open sites, coniferous forest, rocky areas in alpine
CF, MZ	METZGERIA TEMPERATA		BAO	BR	LIVER-WORT	Hypermaritime, on tree trunks, usually shaded, near coast; growing in dense mats or mixed among other bryophytes
CF	MICROCALICIUM ARENARIUM		BAO	LI	Lichen	boles of large trees, partically on a small selection of lichens on aged bark or wood, humid rock cliffs, (on farinose lichens, e.g., Chaenotheca furfuracea, on rocks or tree trunk bases. Old growth PSME, TSHE, TABR.)
RI, SW	MICROMITRIUM SYNOICUM		BAO	BR	MOSS	
MZ, RI	MICROSERIS BIGELOVII	COAST MICROSERIS	BAO	VA	forb	Open, moist sandy, gravelly areas, in coastal headlands
MG	MICROSERIS DOUGLASII SSP. DOUGLASII	DOUGLAS' MICROSERIS	BAO	VA	forb	Inland clay soils, grassland, often near vernal pools or serpentine outcrops
SE	MICROSERIS HOWELLII	HOWELL'S MICROSERIS	STO	VA	forb	Serpentine soils on flat or sloped moist to rocky areas
SC,MG	MICROSERIS LACINIATA SSP. DETLINGII	DETLING'S MICROSERIS	BSO	VA	forb	Open grassland, meadows, rocky slopes, forest edge
RK	MIMULUS BOLANDERI*	BOLANDER'S MONKEYFLOWER	BAO	VA	forb	Burns, openings in chaparral, disturbed areas
RK	MIMULUS CONGDONII*	CONGDON'S MONKEYFLOWER	BAO	VA	forb	Disturbed areas or seepage, runoff areas on slopes, generally granitic soils
RI	MIMULUS EVANESCENS*	DISAPPEARING MONKEYFLOWER	BSO	VA	forb	juniper plant associations, among rocky rubble and boulders in vernally moist, heavy gravel; stream edges, reservoir margins

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RI, CF, SW	MIMULUS TRICOLOR	THREE-COLORED MONKEY-FLOWER	BAO	VA	forb	Vernally wet depressions, streamanks
SE, RK	MONARDELLA PURPUREA	SISKIYOU MONARDELLA	BAO	VA	forb	Serpentine, in open areas in rock, chaparral, woodland, montane forest
SW	NAVARRETIA HETERANDRA	TEHAMA NAVARRETIA	BAO	VA	forb	UNCOMMON. Heavy soil, vernal pools, wet or drying flats
SW	NAVARRETIA WILLAMETTENSIS	WILLAMETTE NAVARRETIA	BSO	VA	forb	Wetland prairie, vernal pools, roadsides.
RK	NEMACLADUS CAPILLARIS	SLENDER NEMACLADUS	BAO	VA	forb	Dry slopes, burned areas
CF, MZ	NIEBLA CEPHALOTA*		BAO	LI	Lichen	trees, shrubs, rocks, coastal fog belt, exposed coastal trees, less often rock
CF	OCTAVIANINA MACROSPORA		BSO	FU	FUNGUS	buried in soil or duff in mixed woods or conifers, favors Doug-fir
MZ	OENOTHERA WOLFII	WOLF'S EVENING-PRIMROSE	STO	VA	forb	Coastal bluffs
MZ, RI	OPHIOGLOSSUM PUSILLUM	ADDER'S-TONGUE	BAO	VA	fern	Wet meadows, marsh edges, deflation plains along the coast
MZ, CF	PANNARIA RUBIGINOSA*		BAO	LI	Lichen	bark or wood, hardwoods shrubs or conifers in wetlands and riparian areas
RK	PELLAEA ANDROMEDIFOLIA*	COFFEE FERN	BAO	VA	fern	Rocky outcrops, non-calcareous rock
RK	PELLAEA MUCRONATA SSP. MUCRONATA*	BIRD'S-FOOT FERN	BAO	VA	fern	Rocky outcrops
CF	PENSTEMON GLAUCINUS	BLUE-LEAVED PENSTEMON	BSO	VA	forb	pine forests
MG,CF, OHW, SW	PERIDERIDIA ERYTHRORHIZA	RED-ROOTED YAMPAH	BSO	VA	forb	moist meadows, poor drained soils, and open woodlands and pine forests
MZ	PHACELIA ARGENTEA	SILVERY PHACELIA	STO	VA	forb	sand dunes
CF	PHACELIA LEONIS	SISKIYOU PHACELIA	BSO	VA	forb	Often ultramafics, rocky to sandy openings in conifer forests
CF	PHAEOCOLLYBIA CALIFORNICA		BSO	FU	FUNGUS	on ground or duff in mixed woods or conifers, favors Doug-fir

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MZ, CF	PHAEOCOLLYBIA GREGARIA*		BSO	FU	FUNGUS	on ground or duff in mixed woods or conifers
CF	PHAEOCOLLYBIA OLIVACEA		BSO	FU	FUNGUS	on ground or duff in mixed woods or conifers
CF	PHAEOCOLLYBIA OREGONENSIS*		BSO	FU	FUNGUS	under conifers
SW	PHYSCOMITRELLA PATENS		BAO	BR	MOSS	mud laid bare from retreating water of lakes and ponds, Willamette Valley wet prairies
RK,CF	PILOPHORUS NIGRICAULIS*		BAO	LI	Lichen	noncalcareous rock substrate (volcanic), cool, moist areas on stable talus slopes; coniferous forests that are especially humid: riverbanks, canyons, coast.
SW	PILULARIA AMERICANA	AMERICAN PILLWORT	BAO	VA	forb aquatic	Vernal pools, mud flats, lake margins, reservoirs, etc
SW	PLAGIOBOTHRYS AUSTINIAE*	AUSTIN'S PLAGIOBOTHRYS	BAO	VA	forb	Vernal pools, wet sites
SW, RI	PLAGIOBOTHRYS FIGURATUS SSP. CORALLICARPUS	CORAL SEEDED ALLOCARYA	BSO	VA	forb	wet meadows, riparian areas, valley floor
SW, RI	PLAGIOBOTHRYS GLYPTOCARPUS	SCULPTURED ALLOCARYA	BAO	VA	forb	Moist places, grasslands, woodlands
SW, RI	PLAGIOBOTHRYS GREENEI	GREENE'S POPCORN FLOWER	BAO	VA	forb	Wet sites, grassland to woodland
SW,OHW	PLAGIOBOTHRYS HIRTUS*	ROUGH POPCORN FLOWER	FEO/ STO	VA	forb	Moist places, grasslands, woodlands
SW, RI	PLAGIOBOTHRYS LAMPROCARPUS	SHINY-FRUITED ALLOCARYA	SEO	VA	forb	Moist places, grasslands, woodlands
CF,MG	POA RHIZOMATA*	TIMBER BLUEGRASS	BAO	VA	grass	UNCOMMON. Shady moist slopes in forest, in rich loose soils, over granitics
MZ	POA UNILATERALIS	SAN FRANCISCO BLUEGRASS	BAO	VA	grass	Coastal headlands and prairires in +/- saline soils
SW	POGOGYNE FLORIBUNDA*	PROFUSE-FLOWEREED MESA MINT	BSO	VA	forb	UNCOMMON. Vernal pools, seasonal lakes
MZ, SW, RI	POHLIA SPHAGNICOLA		BAO	BR	MOSS	sphagmum hummocks

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
CF, RI, RK	POLYSTICHUM CALIFORNICUM*	CALIFORNIA SWORD-FERN	BAO	VA	fern	Woods, streambanks, to rocky open slopes with moisture
RK	POLYTRICHUM SPHAEROTHECIUM		BAO	BR	MOSS	montane and coastal bogs
OHW	PORELLA BOLANDERI		BAO	BR	LIVER-WORT	on rocks and bark of living trees QUGA4 forest, PSME forest on rock outcrops. Maple bark, tree trunk bases in CA.
RI	PORELLA VERNICOSA VAR. FAURIEI		BAO	BR	LIVER-WORT	Columbia Gorge, 1 known site
RI	POTAMOGETON DIVERSIFOLIUS	RAFINESQUE'S PONDWEED	BAO	VA	forb aquatic	Uncommon. Shallow water, ditches, ponds, lakes
RI	POTAMOGETON FOLIOSUS VAR. FIBRILLOSUS	FIBROUS PONDWEED	BAO	VA	forb aquatic	Shallow water, small streams
RK	POTENTILLA VILLOSA	VILLOUS CINQUEFOIL	BAO	VA	forb	
CF	PSEUDOCYPHELLARIA MALLOTA*		BAO	LI	Lichen	old conifers or understory harwoods, (TABR2, RHMA3 branches in late successional forests, also branches, young ALRU2 or PSME forest).
RK, SE	PSEUDOLESKEELLA SERPENTINENSIS		BAO	BR	MOSS	serpentine endemic, found on rock
SW, MZ	PYRROCOMA RACEMOSA VAR. RACEMOSA	RACEMOSE PYRROCOMA	BAO	VA	forb	Wet meadows and open places, coastal valleys, marshes, sometimes in saline soils
RI	RACOMITRIUM DEPRESSUM		BAO	BR	MOSS	plants growing in streams, mostly high montane
RK	RADULA BRUNNEA		BAO	BR	LIVER-WORT	north-facing basalt breccia cliffs, peaty ledges, sheltered and open sites just below the ridgetop, grows in thick mats
MZ, RI	RAMALINA POLLINARIA*		BAO	LI	Lichen	bark and wood of various trees and shrubs, especially old ones, shaded rocks, low elevation moist areas, swamps
CF	RAMARIA SPINULOSA		BSO	FU	FUNGUS	conifers

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
CF, MZ	RAMARIA SPINULOSA VAR. DIMINUTIVA*		BSO	FU	FUNGUS	on ground or duff in conifers stands
OHW, MG	RANUNCULUS AUSTROOREGANUS	SOUTHERN OREGON BUTTERCUP	BSO	VA	forb	open meadows, chaparrel, valley floor
SC	RHAMNUS ILICIFOLIA	REDBERRY	BAO	VA	shrub, small tree	Chaparral, montane forests
CF	RHIZOMNIUM NUDUM		BAO	BR	MOSS	moist soil in woods and along streams, mid to high elevation moist conifer forests
CF	RHIZOPOGON CHAMALEONTINUS		BSO	FU	FUNGUS	buried in soil or duff in conifers stands
CF	RHIZOPOGON ELLIPSOSPORUS*		BSO	FU	FUNGUS	buried in soil or duff in conifers stands
MZ, CF	RHIZOPOGON EXIGUUS		BSO	FU	FUNGUS	buried in soil or duff in conifers stands
SW	RHYNCHOSPORA CAPITELLATA	BROWNISH BEAKRUSH	BAO	VA	sedge	Marshes, seeps
RK	RHYTIDIUM RUGOSUM		BAO	BR	MOSS	Forming loose mats on dry soil or rock, usually on the sloping sides and tops of dry bluffs and cliffs, at middle to higher elevations west of Cascade Range, usually calcareous regions.
MG,SW, RK, RI	ROMANZOFFIA THOMPSONII	THOMPSON'S MISTMAIDEN	BSO	VA	forb	moist rocky areas, wet cliffs, south facing slopes steep, well drained slopes.
RI, SW	RORIPPA COLUMBIAE*	COLUMBIA CRESS	BSO	VA	forb	Meadows, playas, seasonal stream bottoms, river margins
RI	ROTALA RAMOSIOR	TOOTHCUP	BAO	VA	forb	Lake and pond margins, streamsWet places, lake and pond margins, streams, sloughs, vernal pools, irrigated fields, <1900m.
SE,RI	SALIX DELNORTENSIS	DEL NORTE WILLOW	BAO	VA	shrub	Serpentine riparian areas
RK	SAXIFRAGOPSIS FRAGARIOIDES*	JOINT-LEAVED SAXIFRAGE	BAO	VA	forb	Uncommon. Rock crevices
RK	SCAPANIA GYMNOSTOMOPHILA		BAO	BR	LIVER-WORT	
RI	SCHEUCHZERIA PALUSTRIS VAR. AMERICANA	SCHEUCHZERIA	BAO	VA	aquatic or terrestrial	Floating mats, bogs, lake margins, Cascades

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
CF	SCHISTOSTEGA PENNATA		BAO	BR	MOSS	humid lowland forests, intensly shaded recesses, rock or mineral soil, riparian old growth or near lakes on the Cascade crest floresces
RI	SCIRPUS PENDULUS	DROOPING BULRUSH	BAO	VA	sedge	Marshes, wet meadows, ditches
RI, MZ	SCIRPUS SUBTERMINALIS	WATER CLUBRUSH	BAO	VA	sedge	Fress water lake margins, ponds, marshes, shallow water
RK	SEDUM MORANII	ROGUE RIVER STONECROP	BSO	VA	subshrubs, fleshy	Rock outcrops, local endemic, Rogue River (serpentine??)
RK	SEDUM OBLANCEOLATUM	APPLEGATE STONECROP	BSO	VA	subshrubs, fleshy	Rocky slopes
SE	SENECIO HESPERIUS	WESTERN SENECIO	BSO	VA	forb	serpentine areas, open meadows, chaparrel, Jeffery Pine
MG	SIDALCEA CAMPESTRIS	MEADOW SIDALCEA	BSO	VA	forb	grassy meadows and hillsides uplands
RI	SIDALCEA HENDERSONII	HENDERSON'S SIDALCEA	BSO	VA	forb	Coastal tideland and marshes
RK,SC	SIDALCEA HICKMANII SSP. NOV.*	HICKMAN'S CHECKERBLOOM	BSO	VA	forb	Chaparral, open conifer forest, sometimes on serpentine
MZ, MG, CF, SE, ME	SIDALCEA MALVIFLORA SSP. PATULA	COAST CHECKER BLOOM	BSO	VA	forb	Open coastal forest, prairie, mixed evergreen forest, grassy coastal headlands and meadows, often serpentine soils
MG	SIDALCEA NELSONIANA	NELSON'S HECKERMALLOW	FTO/ STO	VA	forb	moist open meadows and woodlands
OHW	SILENE HOOKERI SSP. BOLANDERI	BOLANDER'S CATCHFLY	BAO	VA	forb	Serpentine, rocky slopes, open areas, oak woodland, coniferous forest
MG	SISYRINCHIUM HITCHCOCKII*	HITCHCOCK'S BLUE-EYED GRASS	BSO	VA	forb	Willamette Valley and Umpqua Valley grasslands and oak woodlands
MG, RI	SISYRINCHIUM SARMENTOSUM	PALE BLUE-EYED GRASS	BSO	VA	forb	wet meadows and stream margins
OHW	SOLANUM PARISHII	PARISH'S HORSE-NETTLE	BAO	VA	forb	Dry chaparral, oak/pine woodland, pine forest
OHW, CF	SOPHORA LEACHIANA	WESTERN SOPHORA	BSO	VA	forb	ultramafics, open to sparsely wooded areas

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
RI	SPHAEROCARPOS HIANS		BSO	BR	LIVER-WORT	On mud of river bank, seasonal ephemeral which is evident in summer (Pullman) and fall (Corvallis) when water levels are low (3 known disjunct localities)
RI	SPLACHNUM AMPULLACEUM		BAO	BR	MOSS	Forming green sods on old dung of herbivores, or on soil enriched by dung, in peatlands or wetlands.
MZ	STELLARIA HUMIFUSA	CREEPING CHICKWEED	BAO	VA	forb	Known from Alsea Bay Island
CF,RK	STEREOCAULON SPATHULIFERUM		BAO	LI	Lichen	siliceous rock, north-facing talus slopes, cool moist habitats, subalpine to alpine in the Cascades
SE,CF, OHW	STREPTANTHUS HOWELLII	HOWELL'S STREPTANTHUS	BSO	VA	forb	ultramafics, sparsely wooded areas, open conifer and hardwood forests
CF	STREPTOPUS STREPTOPOIDES	KRUHSEA	BAO	VA	forb	alpine forests
CF,OHW	SULCARIA BADIA		BAO	LI	Lichen	Bark and limbs, canopy, pendulus, hardwoods mostly and conifers; dry open conifer forests, coastal pine forest
RK	SULLIVANTIA OREGANA	OREGON SULLIVANTIA	BSO	VA	forb	wet rocks and cliffs
CF	TAYLORIA SERRATA		BAO	BR	MOSS	sphagnum wetlands, high nitrogen substrates of dung and long decayed carcasses.
MZ	TELOSCHISTES FLAVICANS*		BAO	LI	Lichen	coastal headlands, fog belt, on bark and wood of conifers and hardwoods
CF	TETRAPHIS GENICULATA		BAO	BR	MOSS	humid conifer forests, coastal areas to sub alpine, on large rotten logs and wood or peaty soil, rarely rock

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
CF	TETRAPLODON MNIOIDES*		BAO	BR	MOSS	lowland moist forests, on old dung or soil and rotten wood enriched by dung or carcasses, in peatlands as well as drier uplands.
SC, MG	TEXOSPORIUM SANCTI-JACOBI		BAO	LI	Lichen	biotic crust, arid to semi-arid grasslands, shrublands, or savannas, intolerance of calcareous, saline, and heavily disturbed sites
MZ, CF	THAXTEROGASTER PAVELEKII		BSO	FU	FUNGUS	buried in soil or duff in conifers stands
SW	THELYPODIUM BRACHYCARPUM	SHORT-PODDED THELYPODY	BAO	VA	forb	UNCOMMON. Alkaline soils, adobe flats, pond margins
CF	THOLURNA DISSIMILIS*		BAO	LI	Lichen	branches of exposed conifers, rarely on rock, subalpine and alpine habitats. Occasionally lower elevation where cool, moist.
RI,CF	TREMATODON BOASII		BSO	BR	MOSS	tiny, moist soil along streams, ponds, subalpine, Central Cascades
CF, SC	TRILLIUM KURABAYASHII	SISKIYOU TRILLIUM	BAO	VA	forb	Moists forest, montane coniferous forest, foothill woodland, and chaparral
RK, CF	TRIPTEROCLADIUM LEUCOCLADULUM		BAO	BR	MOSS	Forming mats on shaded to exposed rocks, cliffs and bark of hardwoods such as oak and bigleaf maple, mostly at low elevations
MZ, CF	TRIQUETRELLA CALIFORNICA		BSO	BR	MOSS	coastal grasslands downslope of rock outcrops, within 10 miles of coast.
RK, MG, CF	TRITELEIA HENDERSONII VAR. LEACHIAE	LEACH'S BRODIAEA	BSO	VA	forb	Rocky areas, forest edges, wooded or open slopes and brush, meadow edges
CF	TRITELEIA IXIOIDES SSP. ANILINA	SIERRA BRODIAEA	BAO	VA	forb	Coniferous forest edge, often in gravel or sand
MG, SC, ME	TRITELEIA LAXA	ITHURIEL'S SPEAR	BAO	VA	forb	Meadows in mixed evergreen, foothill woodland, and chaparral

Habitat Groups	Scientific Name	Common Name	Bureau Status	Taxon	Life Form	Habitat Description
CF, RI	TRITOMARIA EXSECTIFORMIS		BAO	BR	LIVER-WORT	decaying wood in contact with water, mid elevation riparian areas
CF	USNEA NIDULANS		BAO	LI	Lichen	On both conifers and hardwoods, immediate coast and coast ranges. Found in stand of PSME, TSHE, THPL, ALRU2.; TSHE/ POMU Association
SW, MZ, RI	UTRICULARIA GIBBA*	HUMPED BLADDERWORT	BAO	VA	forb	Ponds, shallow lakes, bogs, wetlands, creeping over moss or mud
SW, MZ, RI	UTRICULARIA MINOR	LESSER BLADDERWORT	BAO	VA	forb	Wetlands, ponds, shallow lakes, margins, sphagnum bogs
RI	UTRICULARIA OCHROLEUCA	NORTHERN BLADDERWORT	BAO	VA	forb	Wetlands, ponds, shallow lakes, margins, sphagnum bogs
SE, SW	VIOLA PRIMULIFOLIA SSP. OCCIDENTALIS	WESTERN BOG VIOLET	BSO	VA	forb	Serpentine marshes, bogs and fens
RI	WOLFFIA BOREALIS	DOTTED WATER-MEAL	BAO	VA	forb	Freshwater ponds, sloughs; <100m
RI, SW	WOLFFIA COLUMBIANA	COLUMBIA WATER-MEAL	BAO	VA	forb	Freshwater ponds, sloughs; <100m
SC	ZYGADENUS FONTANUS*	SMALL-FLOWERED DEATH CAMAS	BAO	VA	forb	Meadows in foothill woodland, and chaparral

Table 241. Survey and Manage Species Habitat Groups

SPECIES GROUP	HABITAT GROUPS	SCIENTIFIC NAME
Bryophyte	CF	Brotherella roelli
Bryophyte	CF,RI	Buxbaumia viridis
Bryophyte	CF	Diplophyllum albicans
Bryophyte	CF	Diplophyllum plicatum
Bryophyte	CF,RK	Encalypta brevicolla var. crumiana
Bryophyte	CF,RK	Herbertus aduncus
Bryophyte	CF	Iwatsukiella leucotricha
Bryophyte	CF,RI	Kurzia makinoana
Bryophyte	RI	Marsupella emarginata var. aquatica
Bryophyte	CF	Orthodontium gracile
Bryophyte	CF	Racomitrium aquaticum
Bryophyte	CF,RI	Rhizomnium nudum
Bryophyte	CF,RI	Schistostega pennata
Bryophyte	CF	Tetraphis geniculata
Bryophyte	CF,RI	Tritomaria exsectiformis

SPECIES GROUP	HABITAT GROUPS	SCIENTIFIC NAME
Bryophyte	RI,RK	Tritomaria quinquedentata
Fungus	CF	Acanthophysium farlowii
Fungus	CF	Albatrellus avellaneus
Fungus	CF	Albatrellus caeruleoporus
Fungus	CF	Albatrellus ellisii
Fungus	CF	Albatrellus flettii
Fungus	CF	Alpova alexsmithii
Fungus	CF	Alpova olivaceotinctus
Fungus	CF	Arcangeliella camphorata
Fungus	CF	Arcangeliella crassa
Fungus	CF	Arcangeliella lactarioides
Fungus	CF	Asterophora lycoperdoides
Fungus	CF	Asterophora parasitica
Fungus	CF	Baeospora myriadophylla
Fungus	CF	Balsamia nigrens
Fungus	CF	Boletus haematinus
Fungus	CF	Boletus pulcherrimus
Fungus	CF	Bondarzewia mesenterica
Fungus	CF	Bridgeoporus nobilissimus
Fungus	CF	Cantharellus subalbidus
Fungus	CF	Catathelasma ventricosa
Fungus	CF	Chalciporus piperatus
Fungus	CF	Chamonixia caespitosa
Fungus	CF	Choiromyces alveolatus
Fungus	CF	Choiromyces venosus
Fungus	CF	Chromosera cyanophylla
Fungus	CF	Chroogomphus loculatus
Fungus	CF	Chrysomphalina grossula
Fungus	CF	Clavariadelphus ligula
Fungus	CF	Clavariadelphus occidentalis
Fungus	CF	Clavariadelphus sachalinensis
Fungus	CF	Clavariadelphus subfastigiatus
Fungus	CF	Clavariadelphus truncatus
Fungus	CF	Clavulina castanopes var. lignicola
Fungus	CF	Clitocybe senilis
Fungus	CF	Clitocybe subditopoda
Fungus	CF	Collybia bakerensis
Fungus	CF	Collybia racemosa
Fungus	CF	Cordyceps capitata
Fungus	CF	Cordyceps ophioglossoides
Fungus	CF	Cortinarius barlowensis
Fungus	CF	Cortinarius boulderensis
Fungus	CF	Cortinarius cyanites
Fungus	CF	Cortinarius depauperatus
Fungus	CF	Cortinarius magnivelatus
Fungus	CF	Cortinarius olympianus
Fungus	CF	Cortinarius speciosissimus

SPECIES GROUP	HABITAT GROUPS	SCIENTIFIC NAME
Fungus	CF	Cortinarius tabularis
Fungus	CF	Cortinarius umidicola
Fungus	CF	Cortinarius valgus
Fungus	CF	Cortinarius variipes
Fungus	CF	Cortinarius verrucisporus
Fungus	CF	Cortinarius wiebeae
Fungus	CF	Craterellus tubaeformis
Fungus	CF	Cudonia monticola
Fungus	CF	Cyphellostereum laeve
Fungus	CF	Dermocybe humboldtensis
Fungus	CF	Destuntzia fusca
Fungus	CF	Destuntzia rubra
Fungus	CF	Dichostereum boreale
Fungus	CF	Elaphomyces anthracinus
Fungus	CF	Elaphomyces subviscidus
Fungus	CF	Endogone acrogena
Fungus	CF	Endogone oregonensis
Fungus	CF	Entoloma nitidum
Fungus	CF	Fayodia bisphaerigera
Fungus	CF	Fevansia aurantiaca
Fungus	CF	Galerina atkinsoniana
Fungus	CF	Galerina cerina
Fungus	CF	Galerina heterocystis
Fungus	CF	Galerina sphagnicola
Fungus	CF	Galerina vittaeformis
Fungus	CF	Gastroboletus imbellus
Fungus	CF	Gastroboletus ruber
Fungus	CF	Gastroboletus subalpinus
Fungus	CF	Gastroboletus turbinatus
Fungus	CF	Gastroboletus vividus
Fungus	CF	Gastrosuillus amaranthii
Fungus	CF	Gastrosuillus umbrinus
Fungus	CF	Gautieria magnicellaris
Fungus	CF	Gautieria otthii
Fungus	CF	Gelatinodiscus flavidus
Fungus	CF	Glomus radiatum
Fungus	CF	Gomphus bonarii
Fungus	CF	Gomphus clavatus
Fungus	CF	Gomphus kauffmanii
Fungus	CF	Gymnomyces abietis
Fungus	CF	Gymnomyces nondistincta
Fungus	CF	Gymnopilus punctifolius
Fungus	CF	Gyromitra californica
Fungus	CF	Gyromitra esculenta
Fungus	CF	Gyromitra infula
Fungus	CF	Gyromitra melaleucoides
Fungus	CF	Gyromitra montana

SPECIES GROUP	HABITAT GROUPS	SCIENTIFIC NAME
Fungus	CF	Hebeloma olympianum
Fungus	CF	Helvella crassitunicata
Fungus	CF	Helvella elastica
Fungus	CF	Helvella maculate
Fungus	CF	Hydnotrya inordinata
Fungus	CF	Hydnotrya subnix
Fungus		Hydnum umbilicatum
Fungus	CF	Hydropus marginellus
Fungus	CF	Hygrophorus caeruleus
Fungus	CF	Hygrophorus karstenii
Fungus	CF	Hygrophorus vernalis
Fungus	CF	Hypomyces luteovirens
Fungus	CF	Leucogaster citrinus
Fungus	CF	Leucogaster microsporus
Fungus	CF	Macowanites chlorinosmus
Fungus	CF	Macowanites lymanensis
Fungus	CF	Macowanites mollis
Fungus	CF	Marasmius applanatipes
Fungus	CF	Martellia fragrans
Fungus	CF	Martellia idahoensis
Fungus	CF	Mycena hudsoniana
Fungus	CF	Mycena monticola
Fungus	CF	Mycena overholtsii
Fungus	CF	Mycena quinaultensis
Fungus	CF	Mycena tenax
Fungus	CF,RI	Mythicomyces corneipes
Fungus	CF	Neolentinus adhaerens
Fungus	CF	Neolentinus kauffmanii
Fungus	CF	Neournula pouchetii
Fungus	CF	Nivatogastrium nubigenum
Fungus	CF	Octavianina cyanescens
Fungus	CF	Octavianina macrospora
Fungus	CF	Octavianina papyracea
Fungus	CF	Otidea leporina
Fungus	CF	Otidea onotica
Fungus	CF	Otidea smithii
Fungus	CF	Phaeocollybia attenuata
Fungus	CF	Phaeocollybia californica
Fungus	CF	Phaeocollybia dissiliens
Fungus	CF	Phaeocollybia fallax
Fungus	CF	Phaeocollybia gregaria
Fungus	CF	Phaeocollybia kauffmanii
Fungus	CF	Phaeocollybia olivacea
Fungus	CF	Phaeocollybia oregonensis
Fungus	CF	Phaeocollybia piceae
Fungus	CF	Phaeocollybia pseudofestiva
Fungus	CF	Phaeocollybia scatesiae

SPECIES GROUP	HABITAT GROUPS	SCIENTIFIC NAME
Fungus	CF	Phaeocollybia sipei
Fungus	CF	Phaeocollybia spadicea
Fungus	CF	Phellodon atratus
Fungus	CF	Pholiota albivelata
Fungus	CF	Pithya vulgaris
Fungus	CF	Plectania melastoma
Fungus	CF	Plectania mllleri
Fungus	CF	Podostroma alutaceum
Fungus	CF	Polyozellus multiplex
Fungus	CF	Pseudaleuria quinaultiana
Fungus	CF	Ramaria abietina
Fungus	CF	Ramaria amyloidea
Fungus	CF	Ramaria araiospora
Fungus	CF	Ramaria aurantiisiccescens
Fungus	CF	Ramaria botryis var. aurantiiramosa
Fungus	CF	Ramaria celerivirescens
Fungus	CF	Ramaria claviramulata
Fungus	CF	Ramaria concolor f. marrii
Fungus	CF	Ramaria concolor f. tsugina
Fungus	CF	Ramaria conjunctipes var. sparsiramosa
Fungus	CF	Ramaria coulterae
Fungus	CF	Ramaria cyaneigranosa
Fungus	CF	Ramaria gelatiniaurantia
Fungus	CF	Ramaria gracilis
Fungus	CF	Ramaria hilaris var. olympiana
Fungus	CF	Ramaria largentii
Fungus	CF	Ramaria lorithamnus
Fungus	CF	Ramaria maculatipes
Fungus	CF	Ramaria rainierensis
Fungus	CF	Ramaria rubella var. blanda
Fungus	CF	Ramaria rubribrunnescens
Fungus	CF	Ramaria rubrievanescens
Fungus	CF	Ramaria rubripermanens
Fungus	CF	Ramaria spinulosa var. diminutiva
Fungus	CF	Ramaria stuntzii
Fungus	CF	Ramaria suecica
Fungus	CF	Ramaria thiersii
Fungus	CF	Ramaria verlotensis
Fungus	CF	Rhizopogon abietis
Fungus	CF	Rhizopogon atroviolaceus
Fungus	CF	Rhizopogon brunneiniger
Fungus	CF	Rhizopogon chamaleontinus
Fungus	CF	Rhizopogon ellipsosporus
Fungus	CF	Rhizopogon evadens var. subalpinus
Fungus	CF	Rhizopogon exiguus
Fungus	CF	Rhizopogon flavofibrillosus
Fungus	CF	Rhizopogon inquinatus

SPECIES GROUP	HABITAT GROUPS	SCIENTIFIC NAME
Fungus	CF	Rhizopogon truncatus
Fungus	CF	Rhodocybe speciosa
Fungus	CF	Rickenella swartzii
Fungus	CF	Russula mustelina
Fungus	CF	Sarcodon fuscoindicus
Fungus	CF	Sarcodon imbricatus
Fungus	CF	Sarcosoma latahense
Fungus	CF	Sarcosoma mexicana
Fungus	CF	Sarcosphaera eximia
Fungus	CF	Sedecula pulvinata
Fungus	CF	Sowerbyella rhenana
Fungus	CF	Sparassis crispa
Fungus	CF	Spathularia flavida
Fungus	CF	Stagnicola perplexa
Fungus	CF	Thaxtoerogaster pavelekii
Fungus	CF	Tremiscus helvelloides
Fungus	CF	Tricholoma venenatum
Fungus	CF	Tricholomopsis fulvescens
Fungus	CF	Tuber asa
Fungus	CF	Tuber pacificum
Fungus	CF	Tylopilus porphyrosporus
Lichen	CF,MZ	Bryoria pseudocapillaris
Lichen	CF,MZ	Bryoria spiralifera
Lichen	CF	Bryoria subcana
Lichen	CF,OHW	Bryoria tortuosa
Lichen	CF,MZ	Buellia oidalea
Lichen	CF,OHW	Calicium abietinum
Lichen	CF	Calicium adspersum
Lichen	CF	Calicium glaucellum
Lichen	CF	Calicium viride
Lichen	CF	Cetrelia cetrarioides
Lichen	CF	Chaenotheca chrysocephala
Lichen	CF,OHW	Chaenotheca ferruginea
Lichen	CF	Chaenotheca furfuracea
Lichen	CF	Chaenotheca subroscida
Lichen	CF	Chaenothecopsis pusilla
Lichen	CF	Cladonia norvegica
Lichen	CF	Collema nigrescens
Lichen	CF,OHW	Dendriscocaulon intricatulum
Lichen	CF,RI	Dermatocarpon meiophyllizum (ex. luridum)
Lichen	CF,MZ	Fuscopannaria saubinetii
Lichen	CF	Heterodermia sitchensis
Lichen	CF	Hypogymnia duplicata
Lichen	CF	Hypogymnia oceanica
Lichen	CF,MZ	Hypogymnia vittata
Lichen	CF	Hypotrachyna revoluta
Lichen	CF	Leptogium burnetiae var. hirsutum

SPECIES GROUP	HABITAT GROUPS	SCIENTIFIC NAME
Lichen	CF	Leptogium cyanescens
Lichen	CF,RI	Leptogium rivale
Lichen	CF	Leptogium teretiusculum
Lichen	CF	Lobaria linita
Lichen	CF,RK	Microcalicium arenarium
Lichen	CF	Nephroma bellum
Lichen	CF	Nephroma isidiosum
Lichen	CF	Nephroma occultum
Lichen	CF,MZ	Niebla cephalota
Lichen	CF	Pannaria rubiginosa
Lichen	CF	Pannaria saubinettii
Lichen	CF	Peltigera pacifica
Lichen	CF	Platismatia lacunosa
Lichen	CF	Pseudocyphellaria rainierensis
Lichen	CF	Pseudocyphellaria perpetua
Lichen	CF,MZ	Pyrrhospora quernea
Lichen	CF,MZ	Ramalina pollinaria
Lichen	CF,OHW	Ramalina thrausta
Lichen	CF	Stenocybe clavata
Lichen	CF,OHW,MZ	Teloschistes flavicans
Lichen	CF,MZ	Tholurna dissimilis
Lichen	CF,SH	Usnea hesperina
Lichen	CF	Usnea longissima
Vascular_Plant	CF	Botrychium minganense
Vascular_Plant	CF	Botrychium montanum
Vascular_Plant	CF	Coptis asplenifolia
Vascular_Plant	CF	Coptis trifolia
Vascular_Plant	CF,RI	Corydalis aquae-gelidae
Vascular_Plant	CF	Cypripedium fasciculatum
Vascular_Plant	CF	Cypripedium montanum
Vascular_Plant	CF	Eucephalus vialis
Vascular_Plant	CF	Galium kamtschaticum
Vascular_Plant	CF	Platanthera orbiculata var. orbiculata



Appendix F. Invasive Plants

This appendix provides background on the methodology used in the analysis of invasive plants.

In this appendix:

Analytical methods used to determine relative risk to introduce invasive plant species between the alternatives..... 1015

Analytical methods used to determine relative risk to introduce invasive plant species between the alternatives.

Analytical assumptions used for the effects analysis are integrated into the invasive plants portion of Chapters 3 and 4. The analytical methods used to determine the relative risk to introducing and spreading invasive plant species between the alternatives are described in this appendix.

The condition of invasive plant infestations on BLM managed lands in western Oregon can be characterized by analyzing a few invasive species. The following representative sample of invasive species is used to describe the condition of invasive plants on BLM managed lands in western Oregon on BLM managed lands:

- Yellow starthistle
- Knotweeds
- False brome
- Spotted and diffuse knapweeds
- Meadow knapweed
- Scotch and French brooms
- Dyer's woad
- Canada thistle.

Step 1

Determined the current Invasive Species Distribution Category at the fifth-field watershed level: _

The sample invasive species distribution data was imported from WeedMapper in January 2007 and reported species presence was evaluated for each square mile in a grid applied to the planning area. All of the sample invasive species distribution data was pooled for the analysis.

Invasive Species Distribution Categories of *abundant*, *limited*, and *low* were based on the known species distribution in the fifth-field watersheds:

Abundant

The sample invasive species were reported from more than 25% of the square miles within the fifth-field watershed.

Limited

The sample invasive species were reported from between less than *25%* and more than 1% of the square miles within the fifth-field watershed.

Low

The sample invasive species were reported in no more than 1% of the square miles in the fifth-field watershed.

Figure XX to show Invasive Plant Distribution of seleeted species in the planning area.

Step 2

Determined the relative risk of introdueing invasive plant species into fifth-field watersheds over the first ten years of plan implementation as a by-produet of timber harvest aetivities for eaeh alternative.

Step 2a -

Weights of 1or 5 were assigned to the four timber harvest types based on their respeetive post-harvest light levels. Regeneration and partial harvests were assigned a weight of 5. Commereial thinning and uneven aged management aetivities were assigned a weight of 1.

Step 2b -

Weights of 1, 3 and 5 were assigned to logging methods based on their respective levels of soil disturbanee. Aerial harvests were assigned a weight of 1, cable yarding systems a weight of 3, and ground based methods a weight of 5.

Step 2c -

A combined timber harvest activity weighted value was calculated by multiplying the weights from *Steps 2a* and *2b*.

Step 2d -

These combined timber harvest activity weights were multiplied by the number of acres modeled for harvest in the first ten years, to generate a set of values describing the level of susceptibility for invasive plant introduction as a result of probable timber harvest activities.

Step 2e –

The susceptibility values were evenly divided into three categories: *high*, *medium* and *low*.

Zero values were assigned to fifth field watersheds where there is no BLM ownership.

Figure X (Relative susceptibility of fifth field watersheds to invasive plant introduction, as a result of timber harvest activities in the first ten years) to show which watersheds would generate the most and least post-harvest light and soil disturbance from timber harvest activities.

Step 2f -

Combining invasive species presence with susceptibility generated by timber harvest activities to determine relative risk of introduction.

For each alternative a matrix, use Figure below to determine relative risk of invasive species introduction associated with timber harvest activities in the first ten years for each fifth field watershed in the planning area. Within the matrix invasive plant species distribution categories (*Low*, *Limited*, and *Abundant*) and the susceptibility categories from timber harvest activities (*Low*, *Moderate*, *High*) are related to determine relative risk of introducing invasive plants in the fifth field watersheds as a result of timber harvest activities in the first ten years.

Watersheds with a combination of *Low* invasive species distribution and *Low* or *Moderate* susceptibility for introduction of invasive plants from timber harvest activities would have the lowest risk of invasion. Fifth field watersheds with the highest category for either distribution or susceptibility would have a greater risk of invasive species introduction than watersheds with lower categories.

The greatest risk of invasion would be in fifth field watersheds where both invasive species are *Abundant* and where the susceptibility of introducing invasive plants associated timber harvest activities would be *High*.

Species distribution categories	Susceptibility categories for introduction of invasive plants from timber harvest activities		
	Low	Moderate	High
Low	Low	Low	Moderately Low
Limited	Low	Moderate	Moderate
Abundant	Moderately Low	Moderate	High

Use a figure to show by alternative the relative risk of invasive plant introduction, from timber harvest activities in the first ten years, for each fifth field watershed.

The relative risk of invasive species introduction associated with timber harvest activities in the first ten years is summarized across the alternatives in Figure A where stacked columns show the relative amounts of fifth field watersheds in each of the risk categories.

Step 3

Determined the relative risk of introducing invasive plant species into riparian habitats over the first ten years of plan implementation as a result of timber harvest and associated management activities

A similar analytical process as the one used to determine risk associated with timber harvest activities under all alternatives is used to compare the risk of introducing invasive plants into riparian habitats.

Step 3a -

Weights were applied to the different Riparian Management Area prescriptions to compare the relative risk of invasive plant introduction into riparian areas as an inadvertent by-product of timber harvest activities.

Thinning would occur within the Riparian Management Areas and is a constant proportion of the total thinning acres under all alternatives. Therefore, the thinning acres used to determine the relative risk of introducing invasive plants into fifth field watersheds in the first ten years was also be used for the riparian habitat risk analysis.

Under Alternatives 2 and 3 Riparian Management Area (RMA) widths are 25 feet wide on either side of the intermittent streams which would result in the highest post-harvest shade levels. The analytical assumption for risk of invasive plant introduction in the intermittent RMAs under Alternative 2 and 3 is the shade levels in these intermittent RMAs would mimic the levels in the surrounding timber harvest units. The intermittent stream post-harvest shade levels would be lower under Alternatives 2 and 3 than under the No action alternative and Alternative 1.

Susceptibility weights for invasive plant introduction to riparian habitats associated with timber harvest activities under all alternatives were assigned using Table 242.

Table 242. Susceptibility weights for harvest activity types for introduction of invasive species into riparian areas

Alternative	Timber harvest type	Susceptibility weight
All Alts	Thinnings	1
Alts 2 & 3	Uneven age management Klamath Falls	1
Alt 3	Uneven age management Medford south of Grants Pass	1
Alts 2	Regeneration harvest	2
Alt 3	Partial Harvest	2

Step 3b -

For each alternative, the weights were multiplied by the number of acres modeled for harvest in the first ten years for each harvest type to generate a set of values describing the level of susceptibility for invasive plant introduction into riparian areas from the different timber harvest types.

Step 3c –

Likewise, for each alternative, the logging methods used for these harvesting activities were also be considered to generate riparian habitat susceptibility to invasion associated with these activities in riparian habitats.

Step 3d -

Together, the riparian susceptibility values associated with harvest types and logging methods determine the overall riparian susceptibility to invasion in the first ten years of plan implementation under each alternative.

These two values were multiplied together to generate a comprehensive susceptibility value. These values ranged between E and F and were divided into three equal categories: *high*, *medium* and *low*.

Step 3e -

The riparian susceptibility category and invasive plant distribution category were used to determine the relative risk of introducing invasive species in riparian habitats for the first ten years of plan implementation using the same methods described for timber harvest activities in *Step 2e* above.

Step 4

Determined the relative susceptibility of off-highway vehicle designation areas of having invasive plant introductions as a by-product of the designation.

Step 4a -

Assigned off-highway vehicle designation weights, as identified below, to each part of the fifth field watershed having a different off-highway vehicle designation.

Off-Highway Vehicle Designation Susceptibility weights:

Open/limited Off-Highway Vehicle emphasis and potential emphasis areas = 5

Limited = 3

Closed = 0

Step 4b -

Determine the relative susceptibility for inadvertent introduction of invasive species related to off-highway vehicle use as a by-product of the off-highway vehicle designations.

For the No action and Action alternatives, the susceptibility weights were multiplied by the number of acres modeled for each designation to generate a set of susceptibility values for the fifth field watersheds. These values ranged between E and F and were divided into three equal categories: *high*, *medium* and *low*.

Step 4c -

The riparian susceptibility category and invasive plant distribution category were used to determine the relative risk of introducing invasive species in fifth field watersheds using the same methods described for timber harvest activities in *Step 2e* above.

Step 5

Determined the susceptibility of fifth field watersheds to roadside invasive plant introductions from what we know about road densities, on all ownerships, and current invasive plant distribution categories.

Step 5a –

Divided road densities into classes based on the number of miles of road: < 2 miles/section, 2 – 4 miles/section, 4- 8 miles/section, >8 miles/section

Step 5b –

Used Table 243 to derive roadside susceptibility categories based on invasive plant distribution and road densities in fifth field watersheds.

Table 243. Roadside susceptibility categories based on invasive plant distribution and road densities in fifth field watersheds.

Species distribution categories	Road Densities			
	< 2 miles/ section	2 – 4 miles/ section	4 – 8 miles/ section	> 8 miles/ section
Low	Low	Low	Moderately Low	Moderate
Limited	Low	Moderate	Moderately High	High
Abundant	Moderately Low	Moderately High	High	High

Step 5c –

Figure R shows the relative roadside susceptibility categories for invasive plant introduction, for each fifth field watershed.

The relative susceptibility of invasive species introduction associated with road densities and current invasive plant distribution is shown in Figure V where columns show the relative amounts of fifth field watersheds in each of the susceptibility categories.

Step 6

Determined the risk to fifth field watersheds of roadside invasive plant introductions from their invasive plant distribution categories and the relative amounts of new road construction and road related activities, by alternative.

Step 6a –

Divide the amount of new road construction and road related activities evenly into three categories, *high*, *moderate* and *low*.

Step 6b –

Used the matrix in Table 244 to determine the relative risk categories of invasive plant introduction from the amounts of new road construction and road related activities and species distribution categories.

Table 244. Matrix to determine the relative risk categories of invasive plant introduction from new road construction and related activities

Species distribution categories	Relative Levels of Road Construction and Related Activities		
	Low	Moderate	High
Low	Low	Low	Moderately Low
Limited	Low	Moderate	Moderate
Abundant	Moderately Low	Moderate	High

Step 6c -

A figure will show the relative risk of invasive plant introduction from new road construction and road related activities based on species distribution categories, for each fifth field watershed and by alternative.

The relative risk of invasive species introduction associated with new road construction and related activities and species distribution categories to be shown in a figure.



Appendix G. Wildlife

This appendix provides background on the analysis of wildlife including detailed data from recovery plans, critical habitat for the northern spotted owl and marbled murrelet, and special status animal species.

In this appendix:

Management Opportunities on BLM-Administered Lands in the Recovery Plans for the Columbia White-tailed Deer (Columbia River population), Marbled Murrelet, and Bald Eagle. 1025

Data in Support of Northern Spotted Owl Analysis 1037

Marbled Murrelet Critical Habitat. 1060

Special Status Animal Species 1065

Management Opportunities on BLM-Administered Lands in the Recovery Plans for the Columbia White-tailed Deer (Columbia River population), Marbled Murrelet, and Bald Eagle.

Columbia white-tailed deer (Columbia River population)

The focus of the recovery strategy is on the national wildlife refuge lands and surrounding privately owned lands. Nothing has been excerpted from the recovery plan.

Marbled Murrelet

Portions excerpted from *Recovery Plan For The Threatened Marbled Murrelet (Brachyramphus marmoratus) In Washington, Oregon, And California* (pages 125-160 in USFWS 1997).

D. Narrative Outline for Recovery Actions.

1. Implement management plans for each Marbled Murrelet Conservation Zone

1.3 Oregon Coast Range Zone (Zone 3).

The Oregon Coast Range Zone extends from the Columbia River, south toNorth Bend, Coos County, Oregon. This Zone includes waters within 2 kilometers (1.2 miles) of the Pacific Ocean shoreline and extends inland a distance of up to 56 kilometers *(35* miles) from the Pacific Ocean shoreline and coincides with the "Zone 1" boundary line described by the Forest Ecosystem Management Assessment Team, with minor adjustments (U.S. Department of Agriculture *et al.* 1993). The boundary encompasses all of the marbled murrelet critical habitat units designated (the boundary extends slightly beyond 56 kilometers (35 miles) in certain areas.

This Zone includes the majority of known marbled murrelet occupied sites in Oregon. Marbled murrelet occupied sites along the western portion of the Tillamook State Forest are especially important to maintaining well distributed marbled murrelet populations. Efforts should focus on maintaining these occupied sites, minimizing the loss of unoccupied but suitable habitat, and

decreasing the time for development of new habitat. Relatively few known occupied sites occur north of the Tillamook State Forest. Recovery efforts should be directed at restoring some of the north-south distribution of marbled murrelet populations and habitat in this Zone. Maintenance of suitable and occupied marbled murrelet nesting habitat in the Elliott State Forest, Tillamook State Forest, Siuslaw National Forest, and Bureau of Land Management-administered forests is an essential component for the stabilization and recovery of the marbled murrelet.

1.4 Siskiyou Coast Range Zone (Zone 4).

The Siskiyou Coast Range Zone extends from North Bend, Coos County, Oregon, south to the southern end of Humboldt County, California. It includes waters within 2 kilometers (1.2 miles) of the Pacific Ocean shoreline (including Humboldt and Arcata bays) and, in general, extends inland a distance of 56 kilometers (35 miles) from the Pacific Ocean shoreline and coincides with the "Zone 1" boundary line described by the Forest Ecosystem Management Assessment Team with minor adjustments (U.S. Department of Agriculture *et al.* 1993). The boundary encompasses all of the marbled murrelet critical habitat units designated (the boundary extends slightly beyond 56 kilometers *(35* miles) in certain areas.

This Zone includes the marbled murrelet population occupying sites in Redwood National Park and several state parks (Jedediah Smith, Del Norte, Prairie Creek, Grizzly Creek, and Humboldt) in California. In addition, this Zone includes nesting habitat on private lands in southern Humboldt County. Additional marbled murrelet nesting habitat occurs at lower elevations in western portions of the Smith River National Recreation Area. State policies regarding protection of marbled murrelet occupied sites on private lands differ in the Oregon and California portions of this Zone.

Recovery actions should be focused on preventing the loss of occupied nesting habitat, minimizing the loss of unoccupied but suitable habitat, and decreasing the time for development of new suitable habitat. Much marbled murrelet nesting habitat is found in state and national parks that receive considerable recreational use. The need to maintain high quality marbled murrelet terrestrial habitat should be considered in planning any modifications to state or national parks for recreational purposes. Both highway and campground construction, including picnic areas, parking lots, and visitors centers, could present threats to the marbled murrelet through loss of habitat, nest disturbance, and/or increasing potential predation from corvids associated with human activities such as Steller's jays and crows. Implementing appropriate garbage/trash disposal may help decrease potential predator populations in high human use areas such as county, state and national parks.

This Zone has large blocks of suitable habitat critical to the three-state marbled murrelet population recovery over the next 100 years. However, the amount of suitable habitat protected in parks is probably not sufficient by itself to guarantee long-term survival of marbled murrelets in this Zone. On the other hand, a considerable amount of habitat is preserved in parks such that survival may be more likely in this Zone than in several other Zones. Private lands at the southern end of this Zone are important for maintaining the current distribution of the species. There is already a considerable gap in distribution between this area and the central California population in Zone 6. Efforts should be implemented to, at a minimum, not expand the current distribution gap.

2. Delineate and protect areas of habitat within each Zone.

Areas within each Zone that are essential for marbled murrelet recovery should be delineated and protected, using a variety of means (e.g., designation as critical habitat, protection through Habitat Conservation Plans, management [as reserves] under the Forest Plan, other existing regulatory mechanisms, etc.).

2.1 Protect terrestrial habitat essential for marbled murrelet recovery.

There appears to be little opportunity for increases in marbled murrelet productivity as a result of forest maturation in the near future. Even under optimum conditions and with the successful use of various silvicultural techniques, it will take 50 to 100 years or more to develop new suitable nesting habitat within most reserve areas. Any further substantial reduction in occupied nesting habitat for the marbled murrelet would hamper efforts to stabilize the population and the recovery of the species.

Marbled murrelet population trends described above (also see Appendix B) have led the U.S. Fish and Wildlife Service to conclude that a number of areas, including nesting areas and feeding sites well-distributed throughout its terrestrial and marine range, are essential to the conservation of the species. Late-Successional Reserves, as described in the Forest Plan and the final rule designating critical habitat for marbled murrelets, will eventually contribute to recovery. However, these areas alone are insufficient to reverse the decline and maintain a well-distributed population. Thus, additional areas, including non-Federal lands and marine areas, should be protected using a variety of means including critical habitat, Habitat Conservation Plans, and other existing regulatory mechanisms as described below. If these areas are protected, there is a high likelihood that populations will stabilize.

A. Essential nesting habitats that occur on forest lands managed by the Federal government include:

(1) Any suitable habitat in Late-Successional Reserves located in the Forest Ecosystem Management Assessment Team Zone 1 (see pages IV-23 and IV-24 in U.S. Department of Agriculture *et al.* 1993 for a description of Zone 1);

(4) Other large areas of suitable nesting habitat outside of Late-Successional Reserves on Federal lands. For example, large areas of suitable nesting habitat occur on the Siskiyou National Forest, Oregon, the Six Rivers National Forest, California, and in Redwood National and State Park, California.

2.3 Develop and implement a landscape management strategy for each of the six Conservation Zones.

Although many of the factors that have contributed to the decline of marbled murrelet populations in the three-state area are common to all zones, each zone presents unique challenges to the recovery of the species. For example, mortality resulting from incidental capture in net fisheries is a major concern in Zone 1, mortality from oil spills is a major concern in Zones 2 and 6, and potential loss of key suitable nesting habitat on non-Federal lands is of major concern for all Zones. A landscape management plan that addresses the unique circumstances of each Zone should be developed, taking into consideration all affected parties (Federal, state, tribal, private, etc.).

2.3.1 Develop and implement management plans that incorporate the needs of the marbled murrelet for each protected habitat area on Federal lands.

Each protected habitat area within a particular Zone may have unique ecological features and exists in a unique spatial context with lands that may be managed for a variety of values. It is important that these unique characteristics be addressed in the context of a management plan for each of these areas, including the development of appropriate definitions of suitable marbled murrelet habitat for each Zone. In the development of these plans for each Zone, all managers should have an opportunity to be involved, regional issues must be considered, and recovery objectives must be addressed in a consistent manner throughout the range. In some cases, these management plans could be developed using information from the Late-Successional Reserve assessments called for in the Forest Plan Record of Decision.

Management plans should be based on the best available information on the biology and recovery needs of the marbled murrelet and should be able to adapt to new information as it becomes available. For example, a variety of management activities could decrease predation mortality at marbled murrelet nests (e.g., silvicultural practices designed to provide shelter to nest sites or to speed development of murrelet habitat; garbage removal from state and national parks). Efforts to reduce or eliminate these manmade food sources in state and national parks are currently being discussed. As successful strategies are developed to reduce predation at the nest, they should be incorporated into management plans for specific secured areas. An outline of specific management recommendations is provided in task 3.

3. Incorporate management recommendations for protected habitat areas.

Management recommendations for the marbled murrelet need to address two different biological time frames, which reflect (1) aspects o the murrelet's life history and demographic trends, and (2) the length of time required to develop the majority of new nesting habitat or improve current forest habitat conditions. Short-term actions must address the apparent rapid decline of current populations and the need for immediate stabilization. The ability of marbled murrelet populations to recover rapidly is low due to the low reproductive potential of the species. Long-term actions address the long time-frames required to cultivate or enhance mature forest habitat conditions or to improve marine habitat quality because of the nature and complexity of these ecosystems. Little additional older forest habitat will become available until after 2040.

3.1 Implement short-term actions to stabilize and increase the population.

3.1.1 Maintain/protect occupied nesting habitat and minimize loss of unoccupied but suitable nesting habitat.

3.1.1.1 Maintain occupied nesting habitat.

The loss of occupied nesting habitat appears to be the primary cause of marbled murrelet population declines in Washington, Oregon, and California. The low reproductive potential of this species, and lack of knowledge concerning its ability to locate and reestablish new nesting areas after elimination of nesting habitat, makes it imperative to maintain all occupied nesting habitat, as is being done, for the most part, through implementation of the Forest Plan on Forest Service and Bureau of Land Management lands.

On non-Federal lands the maintenance of all occupied sites also should be the goal. However, it is realized that through the Habitat Conservation Plan process, there may be some limited loss of occupied sites or unsurveyed suitable habitat. In the short-term (the next 5 - 10 years), until additional information is obtained, loss of any occupied sites or unsurveyed suitable habitat should be avoided or the potential impacts significantly reduced through a habitat evaluation and ranking process outlined in the Habitat Conservation Plan.

Short term trade-offs for long-term benefits should be evaluated very carefully at this early stage of marbled murrelet recovery and should be done on a case-by-case basis.

3.1.1.2 Maintain potential and suitable habitat in larger contiguous blocks while maintaining current north/south and east/west distribution of nesting habitat.

By maintaining occupied sites and suitable habitat in larger blocks with low levels of fragmentation, several objectives will be met. Larger stands will (1) have more nesting and hiding opportunities, (2) provide for multiple alternative nesting sites for individual pairs of birds over time, (3) facilitate nesting for multiple pairs of birds (and thus promote increased social contact), and (4) provide greater interior forest habitat conditions (to reduce potential nest and adult predation, increase protection of nests from windstorms and environmental changes, and reduce loss of habitat from windthrow and fire). Larger stands also may provide a core of birds to attract or develop sufficient activity and eventual nesting by subadults or nonbreeding adult birds to replace breeding adults lost from this habitat over time due to natural causes or human activities. The more contiguous the habitat distribution, the lower the likelihood of future large gaps in distribution of the species due to catastrophic events such as oil spills or large wildfires. Preventing further erosion of the already patchily-distributed nesting habitat is a key element in buffering the species against such catastrophic events. This is especially important in areas where gaps already occur. Furthermore, it is currently unknown how nesting success differs with distance from the coast, and far inland habitats may be as important to species survival as those nearer to shore. Therefore, it is important to maintain both north/south and east/west distribution of suitable habitat.

3.1.1.3 Maintain and enhance buffer habitat surrounding occupied habitat.

Maintaining buffers around occupied habitat will mediate the effects of edge by helping to reduce environmental changes within the stand, reduce loss of habitat from windthrow and fire, reduce fragmentation levels, increase the amount of interior forest habitat available, and potentially help reduce predation at the nest. To have the greatest benefits, buffer widths should be a minimum of 300-600 feet and should consist of whatever age stand is present, including existing plantations (which should be managed to provide replacement.

3.1.3 Minimize nest disturbances to increase reproductive success.

Low juvenile:adult ratios have been documented throughout the three-state range of the marbled murrelet (Appendix B). Current evidence suggests that the cause of this low reproductive rate may be due to high rates of predation on eggs, young, and possibly adults at the nest site. Population modeling indicates that adjusted juvenile:adult ratios should be 15 - 22 percent at a minimum to result in stable or increasing



populations. Current best estimates of unadjusted ratios average 5 percent (range 0.1 - 13.8 percent) and it is unlikely that adjustment will result in 4 - 10 times larger ratios. Breeding adult alcids in general are sensitive to nest site disturbance during the incubation period and the first few days of chick rearing. Disturbances near marbled murrelet nest sites that flush incubating or brooding adults from the nest site may expose adults and young to increased predation or accidental loss of eggs or nestlings by falling or being knocked out of nests. Human activities near nesting areas that result in an increase in the number of predators also could lead to a greater likelihood of nest predation. The timing of disturbances should be adjusted to avoid disruption of marbled murrelet activities, such as courtship, mating, and nesting. Human activities should be modified to reduce attraction of predators to specific forest areas although this action may not reduce actual predator numbers over wider areas. Higher-than normal predation levels are likely to occur in nesting habitat due to forest fragmentation and other causes in many cases.

3.2 Implement long-term actions to stop population decline and increase population growth.

3.2.1 Increase the amount and quality of suitable nesting habitat.

An increase in amount and quality of suitable nesting habitat is important in all zones. However, it is especially important in the western Washington Coast Range and the northern portions of the Oregon Coast Range Zones. In these areas, remaining patches of suitable nesting habitat are relatively small and fragmented, involve private and state lands, and are vitally important for maintaining the current small populations in these areas; thus, blocking up habitat is needed to increase patch size. It also would be desirable to increase and block up suitable nesting habitat in the Mendocino and Santa Cruz Mountains Zones. Little habitat remains outside parks in these two zones, such that an increase in the short term does not appear feasible.

3.2.1.1 Decrease fragmentation by increasing the size of suitable stands to provide a larger area of interior forest conditions.

The majority of suitable nest stands currently exist as small islands within a matrix of younger forests. Although these fragments will provide critically important habitat during the several decades required for younger stands to develop structural characteristics suitable for marbled murrelet nesting, they cannot be considered high quality habitat because of vulnerability to wildfire and windthrow, and perhaps a higher abundance of avian predators. Research is needed to develop judicious ways to use silvicultural techniques such as thinning in young (nonhabitat) stands to hasten development of large trees and decrease vulnerability of habitat fragments to fire, wind, and perhaps predators. Consistent with the Forest Plan Record

of Decision, thinning within Late-Successional Reserves should be restricted to stands younger than 80 years. However, the Record of Decision also permits thinning within Late-Successional Reserves up to age 110 in Coast Range lands administered by the Bureau of Land Management (Nestucca block) and in the Oregon and California Klamath Provinces (U.S. Department of Agriculture and U.S. Fish and Wildlife Service 1994b). Unthinned buffers should be left around any occupied stands. Precautions should be taken to reduce fire hazard from thinning slash and avoid soil compaction.

3.2.1.2 Protect "recruitment" nesting habitat to buffer and enlarge existing stands, reduce fragmentation, and provide replacement habitat for current suitable nesting habitat lost to disturbance events.

Stands (currently 80 years old or older) that will produce suitable habitat within the next few decades are the most immediate source of new habitat and may be the only replacement for existing habitat lost to disturbance (e.g., timber harvest, fires, etc.) over the next century. Such stands are particularly important because of the vulnerability of many existing habitat fragments to fire and wind and the possibility that climate change will increase the effects of the frequency and severity of natural disturbances. Such stands should not be subjected to any silvicultural treatment that diminishes their capacity to provide quality nesting habitat in the future. Within secured areas, these "recruitment" stands should not be harvested or thinned. In the matrix (on Federal lands), harvest in younger-aged stands should adhere to the techniques discussed in the following task (3.2.1.3) to more quickly develop into marbled murrelet habitat.

3.2.1.3 Use silvicultural techniques to increase speed of development of new habitat.

Nesting marbled murrelets select stands with large trees that provide suitable nesting platforms (large, protected branches, preferably with moss). When available, large stands appear to be preferred over small ones. Nests have been located in stands with a wide range of stocking densities, however the low rate of nesting success raises considerable uncertainty regarding what constitutes quality habitat. It is expected that since marbled murrelets require very specific structures in order to successfully nest, silvicultural techniques may be available to speed the development of these structures in stands of younger forest.

Several silvicultural techniques may be appropriate to increase the area of suitable nesting stands and the rate at which they develop (e.g., thinning, long rotations, etc.). Thinning accelerates tree growth and can be used as a tool to produce large trees more quickly than in normal stand development. However, simply growing large trees is not

sufficient to obtain suitable marbled murrelet habitat. Trees must have large moss-covered, or mistletoed branches that provide nest platforms, something that is likely to be achieved only by growing at least some trees on long rotations. There are two alternatives for doing that (1) "Green-tree retention" designates approximately 20 - 40 trees per hectare to be retained at harvest, with a new crop of younger trees established beneath the older tree canopy. Leaving trees on site and allowing them to grow to an older age will likely produce marbled murrelet nest trees and eventually produce coarse woody debris (important habitat for numerous other species). As younger trees mature, a multilayered canopy develops, which is also an important structural attribute of older forest habitat; and (2) evidence available at this time indicates that growing whole stands on long rotations will produce higher quality habitat in the long-term than green tree retention, which may create sink habitat for a number of bird species. Long rotations have other ecological and economic benefits as well. Landscapes with a higher proportion of older stands should be less susceptible to catastrophic wildfire (providing reduced hazard from thinning slash). Because thinned Douglas-fir maintains good growth well into its second century, silviculturists now conclude that long rotations are economically viable in the Douglas-fir region.

3.2.2 Improve Distribution of Nesting Habitat.

3.2.2.1 Improve and develop north/south distribution of nesting habitat.

Improving the distribution of nesting habitat helps to buffer existing populations against poor breeding success and catastrophic loss and probably facilitates gene flow among separated populations. Three major gaps in existing habitat are particularly apparent: (1) from the southern Olympic Peninsula in Washington to Tillamook in northwestern Oregon; (2) between Patrick's Point and southern Humboldt Bay in northern California (see Figure 1); and (3) throughout most of the Mendocino Zone and the northern part of the Santa Cruz Mountains Zone (between southern Humboldt County and central San Mateo County). These three geographic gaps represent probable partial barriers to gene flow across them. They include large areas of second-growth forests that originated after logging, from fire (parts of northwestern Oregon), or from natural discontinuities of nesting habitat (especially parts of northern and central California). Gap areas often have a high proportion of private lands and little or no Federal land. State lands cover significant portions of northwest Oregon (the Tillamook and Clatsop State Forests) and southwest Washington. Silvicultural techniques to create suitable habitat at both the stand and landscape level (discussed in task 3.2.1.3) may be particularly beneficial to marbled murrelet recovery in the long term if applied in these areas.

Portions of the Mendocino Zone and Santa Cruz Mountains Zone also contain blocks of unsuitable habitat that probably naturally created small gaps in the murrelet's terrestrial range. Again, loss of suitable habitat around these small natural gaps has greatly widened them. These gaps have probably grown together and eliminated suitable nesting habitat over a large section of their range. The existence of small natural gaps in suitable habitat must be recognized when designing ways to improve and develop north/south distribution of nesting habitat.

3.2.2.2 Improve and develop east/west distribution of nesting habitat.

Improving east-west distribution means filling in habitat gaps within the Conservation Zone boundaries described earlier. Many portions of the species range no longer have large amounts of suitable nesting habitat close to the coast and marbled murrelets must fly considerable distances inland to nest. In addition to the north-south gaps discussed above, opportunities exist on the Olympic Peninsula, Puget trough, and along virtually the entire California coast within the murrelet's range to improve the current east/west distribution of habitat. An important step in developing methods to improve this distribution will be the complete identification of the inland boundary of suitable nesting habitat for the three-state area and identification of factors determining these boundaries in different regions.

Bald Eagle

Portions excerpted from *Recovery Plan for the Pacific Bald Eagle* (pages 73-83 in USFWS 1985).

1. Provide Secure Habitat

Providing secure habitat for eagles involves identifying important habitat, arranging for its long-term protection, and managing it to ensure that its components (e.g., food, nest sties, roost trees) are maintained and enhanced.

1.2 Secure Breeding and Nonbreeding Habitat

Much of the bald eagle habitat in the Pacific recovery area is threatened by development and is not adequate protected by legal statutes. Land use and zoning policies can provide protection in some situations. In others, transfer from private to public ownership must be considered. Habitats in public ownership should be recognized and give priority consideration by agencies. Local working teams (see step 1.26) should play a strong role in all efforts to secure habitat.

1.2.2 Establish Reserves and Management Areas Where Necessary

This approach may be most suitable where human disturbance is a limiting factor for eagles; where intensive, long-term management activities are needed; or where eagle management is being featured over other land management options.



1.2.3 Incorporate Eagle Habitat Guidelines in Agency Land Use Plans

The Bureau of Land Management (BLM) should retain and manage habitat on BLM-administered public lands to benefit bald eagles and compatible uses in accordance with the Federal Land Policy and Management Act (FLPMA). These lands should be identified as important eagle habitat in the Resource Management Planning (RMP) process. The BLM should seriously consider designating all or parts of these areas as "Areas of Critical Environmental Concern".

1.2.5 Design and Implement Plans to Secure Individual Nest Sites, Roosts, and Foraging Areas

Plans must be developed on a site-specific basis throughout the recovery area. Plans should describe the human activities that can be permitted as well as those that must be prohibited. They should also describe the steps needed to protect and secure hey habitat such as nests, roosting trees and food resources. Each plan should include a map outlining the important eagle use areas and a list of appropriate methods for protecting suitable nesting, foraging, and roosting habitat over time.

1.3.2 Maintain and Improve Forested Habitat in Bothe the Breeding and Wintering Range

Timber stands should be managed to promote habitat characteristics required by eagles for long-term nesting and roosting. In most cases, this requires management for old-growth stands. Silvicultural techniques, such as thinning or selective harvest, can help to create proper tree species composition and stand structure. The important element of any silvicultural plan should be to maintain an old growth overstory in the vicinity of nest sties and communal roosts. Development and maintenance of potential eagle habitat is as important as protection and maintenance of habitat currently used by eagles.

1.3.2.1 Maintain Forested Habitat that is Presently Used by Eagles

Habitat loss is currently the most significant threat to bald eagle populations in the 7-state recovery area. The increasing disappearance of old growth stands makes it imperative that existing habitat be protected. In some cases special actions must be taken to maintain existing habitat.

1.3.2.1.1 Prohibit Logging of Known Nest Trees, Perch Trees, and Winter Roost Trees

Trees used by eagles should be clearly identified and protected from logging. In addition, trees that provide wind breaks, that visually shield eagles from disturbances, or that are needed for long-term viability of eagle sue areas must be maintained. Trees with unoccupied nests in suitable habitat and trees which formerly had nests should also be protected because these sites are sometimes used after several years of abandonment and will be important in providing habitat for expanding populations.

1.3.3 Restrict Human Disturbance at Eagle Use Areas

Human activities are known to disrupt eagle activity patterns and in some cases cause reproductive failure. In spite of this, any eagles nest and winter near human population centers. Many types of human disturbances at the right distances are compatible with eagles. Regulation of human activity is a critical part of eagle habitat management.

1.3.3.1 Establish Buffer Zones Around Nest Sites

Buffer zones should be established for individual nest territories based on the location of nest trees, perch trees, and flight paths, as well as stand characteristics, known individual tolerances, and weather patterns.

Until site specific plans are available or until guidelines can be developed by local groups or agencies, guidelines prepared by the U.S. Fish and Wildlife Service Region 1 should serve as minimum protective measures.

1.3.3.2 Exclude Logging, Construction, Habitat Improvement, and Other Activities During Critical Periods of Eagle Use

Picnicking, camping, blasting, firearm use, timber harvest, and low level aircraft operations should not be allowed within 400 meters of nests and roosts during periods of eagle use. These activities should also be regulated up to 800 meters from nests and roosts where eagles have line-of-sight vision. Critical nesting periods vary throughout the recover area but generally fall between 1 January an 31 August. Key wintering areas need protection from disturbance from approximately 15 November to 15 March.

Data in Support of Northern Spotted Owl Analysis

The following section contains background information regarding the northern spotted owl analysis found in Chapter 4. It includes a description of the suitable habitat addressed in section 7 consultations from 1994 to April 12, 2004; available nesting, roosting, and foraging habitat on BLM-administered lands, a description of how the alternatives affect individual critical habitat units; and how lands were classified as owl habitat under Alternative 3.

Suitable habitat addressed in Section 7 Consultation from 1994 – April 12, 2004

Table 245. Aggregate results of all adjusted, suitable habitat (NRF1) acres addressed in section 7 consultation (both formal and informal) for the northern spotted owl; baseline and summary of effects by State, physiographic province and land use function from 1994 to April 12, 2004 (the first decade of the Northwest Forest Plan) (USFWS pers com. 2006).

Physiographic Province[4]		Evaluation Baseline[2]			Habitat Removed/Downgraded[3]			% Provincial Baseline Affected	% Range-wide Affected
		Reserves[5]	Non-Reserves6	Total	Reserves[5]	Non-Reserves[6]	Total		
WA	Olympic Peninsula	548,483	11,734	560,217	67	24	91	-0.02	0.05
	Eastern Cascades	506,340	200,509	706,849	1,746	4,222	5,968	-0.84	3.13
	Western Cascades	864,683	247,797	1,112,480	249	10,952	11,201	-1.01	5.88
	Western Lowlands	0	0	0	0	0	0	0	0
OR	Coast Range	422,387	94,190	516,577	399	4,145	4,544	-0.88	2.39
	Klamath Mountains	448,509	337,789	786,298	2,434	80,394	82,828	-10.53	43.5
	Cascades East	247,624	196,035	443,659	1,813	12,216	14,029	-3.16	7.37
	Cascades West	1,012,426	1,033,337	2,045,763	2,926	52,514	55,440	-2.71	29.11
	Willamette Valley	593	5,065	5,658	0	0	0	0	0
CA	Coast	47,566	3,928	51,494	181	69	250	-0.49	0.13
	Cascades	61,852	2,6385	88,237	0	4,808	4,808	-5.45	2.52
	Klamath	734,103	345,763	1,079,866	1,470	9,800	11,270	-1.04	5.92
Total		4,894,566	2,502,532	7,397,098	11,285	179,144	190,429	-2.57	100

1 Nesting, roosting, foraging habitat. In California, suitable habitat is divided into two components; nesting – roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-6/26/2001. After 6/26/2001, suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.

2 1994 FSEIS baseline (USDA and USDI 1994).

3 Includes both effects reported by USDI FWS (2001) and subsequent effects compiled in the Northern Spotted Owl Consultation Effects Tracking System (web application and database).

4 Defined by the NWFP as the twelve physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of the FSEIS.

5 Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs.

6 Land-use allocations intended to provide habitat to support movement of spotted owls among reserves.

Table 246. Change in suitable spotted owl habitat from 1994 to April 12, 2004, resulting from Federal management actions (Mgmt) and natural events by physiographic province (USFWS pers. com. 2006).

Physiographic Province	Range of Northwest Forest Plan (Acres)	Causes of Habitat Loss		Total Change in Acres	Percent change by Province	Percent of Total Effects[3]
		Mgmt[1]	Natural Events[2]			
Olympic Peninsula	560,217	-91	-299	-390	-0.07	0.10
WA East Cascades	706,849	-5,968	-5,754	-11,722	-1.66	3.14
WA West Cascades	1,112,480	-11201	0	-11,201	-1.01	3.00
Western Lowlands	0	0	0	0	0.00	0.00
OR Coast	516,577	-4,544	-66	-4,610	-0.89	1.23
OR Klamath Mountains	786,298	-82,828	-117,622	-200,450	-25.49	53.61
OR Cascades East	443,659	-10,595	-22,638	-33,233	-7.49	8.89
OR Cascades West	2,045,763	-55,440	-24,583	-80,023	-3.91	21.40
Willamette Valley	5,658	0	0	0	0.00	0.00
CA Coast	51,494	-250	-100	-350	-0.68	0.09
CA Cascades	88,237	-4,808	0	-4,808	-5.45	1.29
CA Klamath	1,079,866	-11,270	-15,869	-27,139	-2.51	7.26
TOTAL	7,397,098	-186,995	-186,931	-373,926	-4.85	100.00

1 Estimates from the NSO consultation effects tracker (Service 2005).
2 Data compiled by the USDI Fish and Wildlife Service, Northern Spotted Owl Coordination Group.
3 Provincial effect expressed as percentage of total range-wide effects.

Table 247. Aggregate results of all adjusted, suitable critical habitat acres affected by Section 7 Consultation for the Northern spotted owl; baseline and summary of effects by state, Physiographic Province and land use function from 1994 to July 19, 2005 (USFWS pers. comm. 2006).

Physiographic Province[3]		Evaluation Baseline[1]			Habitat Removed/Downgraded[2]			% Provincial Baseline Affected	% Range-wide Affected
		Reserves[4]	Non-Reserves[5]	Total	Reserves[4]	Non-Reserves[5]	Total		
WA	Olympic Peninsula	193,081	3,928	197,009	-12	-59	-71	-0.04	0.15
	Eastern Cascades	225,855	100,737	326,592	-87	-4,549	-4,636	-1.42	9.88
	Western Cascades	424,273	90,305	514,578	-3	-4,991	-4,994	-0.97	10.64
	Western Lowlands	0	0	0	0	0	0	0	0
OR	Coast Range	332,562	16,155	348,717	-50	-1,200	-1,250	-0.36	2.66
	Klamath Mountains	228,112	85,157	313,269	-4	-12,923	-12,927	-4.13	27.54
	Cascades East	86,882	51,802	138,684	-334	-1,372	-1,706	-1.23	3.63
	Cascades West	532,571	361,563	894,134	-122	-19,959	-20,081	-2.25	42.78
	Willamette Valley	0	0	0	0	0	0	0	0
CA	Coast	2,589	27	2,616	0	0	0	0	0
	Cascades	47,947	2,740	50,687	0	-472	-472	-0.93	1.01
	Klamath	322,372	33,329	355,701	0	-808	-808	-0.23	1.72
Total		2,396,244	745,743	3,141,987	-612	-46,333	-46,945	-1.49	100

1 1994 FSEIS baseline (USDA and USDI 1994).

2 Includes both effects reported in USDI FWS 2001 and subsequent effects reported in the Northern Spotted Owl Consultation Effects Tracking System (web application and database.)

3 Defined by the Northwest Forest Plan as the twelve physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of the FSEIS.

4 Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs.

5 Land-use allocations intended to provide habitat to support movement of spotted owls among reserves.

Table 248. Change in northern spotted owl suitable critical habitat from 1994 to December 10, 2004, resulting from Federal management actions and natural events by physiographic province. (USFWS pers. comm. 2006)

Physiographic Province	1994 FSEIS Provincial Critical Habitat Baseline	Critical Habitat (acres) Removed/Downgraded, 1994-2004				Percent of 1994 FSEIS Provincial Critical Habitat Baseline	Percent of all Rangewide Habitat Effects
		Management	Fire	Insect/ Disease	Total		
WA:							
Olympic Peninsula	197,009	71	0	0	71	0.04	0.08
East Cascades	326,592	1,035	6,925[1,2]	532	8,492	2.60	9.67
West Cascades	514,578	4,994	0	0	4,994	0.97	5.69
Western Lowlands	0	0	0	0	0	0.00	0.00
OR:							
Coast Range	348,717	1,224	0	0	1,224	0.35	1.39
Klamath Mountains	313,269	13,912	17,453	0	31,365	10.01	35.72
Cascades East	138,684	1,706	6,878[2]	0	8,584	6.18	9.78
Cascades West	894,134	21,003	1,216	0	22,219	2.48	25.31
Willamette Valley	0	0	0	0	0	0.00	0.00
CA:							
Coast Range	2,616	0	0	0	0	0.00	0.00
Cascades	50,687	365	0	0	365	0.72	0.41
Klamath	355,701	808	9,675	0	10,483	2.95	11.95
Total	3,141,987	45,118	42,147	532	87,797	2.79	100.00

[1] Habitat effects from some 1994 fires were included in the 2001 update, and thus, appear as consulted-on effects in the NSO Consultation Effects Tracking Database. For the purpose of this critical habitat update, habitat effects associated with those fires are included in the fire effects column.

[2] Includes fires in 2003.

Northern Spotted Owl Critical Habitat Units

The Endangered Species Act requires the U.S. Fish and Wildlife Service to designate critical habitat to the maximum extent prudent and determinable concurrently with listing a species as endangered or threatened. The U.S. Fish and Wildlife Service listed the northern spotted owl as a threatened species on June 28, 1990, primarily due to concern over widespread habitat loss and modification, and inadequacy of existing regulatory mechanisms. The U.S. Fish and Wildlife Service designated as critical habitat for the northern spotted owl 3,257,000 acres of federal lands in Oregon, including 1,009,000 acres of BLM-administered land (Federal Register. 1992a).

Critical habitat is defined in the Endangered Species Act as: "(i) the specific areas within the geographic area occupied by a species … on which are found those physical and biological features (I) essential to the conservation of the species, and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by a species … upon determination by the Secretary that such areas are essential for the conservation of the species" (Endangered Species Act of 1973, as amended, Sec. 3(5)(A)).

The Endangered Species Act directs Federal agencies to insure that their actions are not likely to result in the "destruction or adverse modification" of designated critical habitat (Endangered Species Act of 1973, as amended, Sec. 7(a)(2)).

None of the alternatives align land use allocations with designated critical habitat units or include management direction specific to designated critical habitat units. Therefore, the amount of suitable habitat within the critical habitat units would result from the land use allocations and management direction in each alternative as it overlays the designated critical habitat units. . As a result, the development of suitable habitat within critical habitat units would not show consistent patterns for any of the alternatives.

Currently, critical habitat units average suitable habitat on 55% of the habitat-capable acres on BLM-administered lands. The only critical habitat units that have more than 90% suitable habitat are two units which have less than 5 acres of BLM-administered lands each.

Under the No Action alternative, the average suitable habitat on BLM-administered lands in critical habitat units would steadily increase to an average of 82% of the habitat-capable acres on BLM-administered lands by 2106. 25 of the 51 critical habitat units would have more than 90% suitable habitat by 2106. On 10 of the 51 critical habitat units, the amount of suitable habitat would decrease from current amounts at some time over the next 100 years.

Under Alternative 1, the average suitable habitat on BLM-administered lands in critical habitat units would decline to 54% in 2016, and then steadily increase to 72% of the habitat-capable acres on BLM-administered lands by 2106. 22 of the 51 critical habitat units would have more than 90% suitable habitat by 2106. On 20 of the 51 critical habitat units, the amount of suitable habitat would decrease from current amounts at some time over the next 100 years.

Under Alternative 2, the average suitable habitat on BLM-administered lands in critical habitat units would decline to 51% in 2016, and then fluctuate until reaching an average of 54% of the habitat-capable acres on BLM-administered lands by 2106. 12 of the 51 critical habitat units would have more than 90% suitable habitat by 2106. On 30 of the 51 critical habitat units, the amount of suitable habitat would decrease from current amounts at some time over the next 100 years.

Under Alternative 3, the average suitable habitat on BLM-administered lands in critical habitat units would decline to 54% in 2016, and then fluctuate until reaching an average of 53% of the habitat-capable acres on BLM-administered lands by 2106. 3 of the 51 critical habitat units would have more than 90% suitable habitat by 2106. On 33 of the 51 critical habitat units, the amount of suitable habitat would decrease from current amounts at some time over the next 100 years.

Table 249. Suitable Habitat within Critical Habitat Units OR-9 – OR-23, by alternative

Critical Habitat Unit	Habitat-capable acres		% of habitat-capable				
			2006	2016	2026	2056	2106
OR-9	18	No Action	11	17	17	72	94
		Alt 1	11	22	22	72	94
		Alt 2	11	22	22	67	94
		Alt 3	11	22	22	72	94
OR-10	201	No Action	69	57	57	37	49
		Alt 1	69	53	27	20	23
		Alt 2	69	64	55	37	17
		Alt 3	69	51	32	19	35
OR-12	22,988	No Action	66	67	67	83	95
		Alt 1	66	66	67	80	94
		Alt 2	66	56	54	62	56
		Alt 3	66	60	52	66	63
OR-14	35,522	No Action	60	60	62	83	92
		Alt 1	60	56	58	78	85
		Alt 2	60	49	41	46	32
		Alt 3	60	47	43	51	46
OR-16	4,339	No Action	70	76	73	73	74
		Alt 1	70	57	47	49	42
		Alt 2	70	43	18	24	39
		Alt 3	70	76	68	40	78
OR-18	2	No Action	100	50	50	50	100
		Alt 1	100	50	50	50	100
		Alt 2	100	50	50	50	50
		Alt 3	100	100	50	50	100
OR-20	9,572	No Action	31	43	53	72	71
		Alt 1	31	37	45	57	37
		Alt 2	31	42	44	39	29
		Alt 3	31	44	53	79	53
OR-21	1,894	No Action	43	47	48	80	66
		Alt 1	43	26	25	49	39
		Alt 2	43	37	34	45	22
		Alt 3	43	51	51	71	48
OR-22	5,050	No Action	30	47	54	75	59
		Alt 1	30	40	40	50	28
		Alt 2	30	40	40	47	22
		Alt 3	30	49	58	73	47
OR-23	8,310	No Action	26	34	52	68	54
		Alt 1	26	29	46	38	30
		Alt 2	26	36	56	82	96
		Alt 3	26	36	54	65	39

Table 250. Suitable Habitat within Critical Habitat Units OR-24 – OR-38, by alternative

Critical Habitat Unit	Habitat-capable acres	Alternative	% of habitat-capable				
			2006	2016	2026	2056	2106
OR-24	6,436	No Action	32	34	40	51	49
		Alt 1	32	30	32	48	42
		Alt 2	32	36	35	44	28
		Alt 3	32	33	37	51	61
OR-25	53,731	No Action	62	62	63	79	95
		Alt 1	62	60	61	75	92
		Alt 2	62	57	54	64	70
		Alt 3	62	53	45	47	53
OR-27	12,903	No Action	58	51	57	60	52
		Alt 1	58	46	47	50	48
		Alt 2	58	56	44	47	36
		Alt 3	58	55	61	51	51
OR-29	11,122	No Action	71	64	62	57	49
		Alt 1	71	66	63	40	37
		Alt 2	71	65	57	22	23
		Alt 3	71	56	47	20	21
OR-31	1,608	No Action	65	61	56	59	55
		Alt 1	65	45	44	36	44
		Alt 2	65	60	60	14	29
		Alt 3	65	58	56	51	59
OR-32	64,955	No Action	53	56	57	69	86
		Alt 1	53	56	57	66	82
		Alt 2	53	53	50	55	60
		Alt 3	53	51	46	53	47
OR-34	35,982	No Action	57	66	64	71	89
		Alt 1	57	60	57	61	81
		Alt 2	57	53	38	23	37
		Alt 3	57	55	53	62	44
OR-36	7,093	No Action	61	60	52	44	47
		Alt 1	61	52	46	41	18
		Alt 2	61	58	49	24	11
		Alt 3	61	60	49	46	29
OR-37	27,864	No Action	71	74	70	60	61
		Alt 1	71	70	63	42	32
		Alt 2	71	69	63	47	31
		Alt 3	71	60	47	40	41
OR-38	34,740	No Action	61	70	72	76	78
		Alt 1	61	66	65	67	72
		Alt 2	61	65	64	65	70
		Alt 3	61	66	66	72	87

Table 251. Suitable Habitat within Critical Habitat Units OR-39 – OR-50, by alternative

Critical Habitat Unit	Habitat-capable acres	Alternative	% of habitat-capable				
			2006	2016	2026	2056	2106
OR-39	7,207	No Action	57	64	70	94	100
		Alt 1	57	64	70	90	99
		Alt 2	57	56	56	62	53
		Alt 3	57	62	64	69	60
OR-40	34	No Action	0	0	0	100	100
		Alt 1	0	0	0	100	100
		Alt 2	0	0	0	100	35
		Alt 3	0	0	0	100	35
OR-41	36,989	No Action	50	53	56	88	100
		Alt 1	50	53	56	87	100
		Alt 2	50	52	55	91	100
		Alt 3	50	50	48	65	57
OR-43	224	No Action	12	31	92	99	100
		Alt 1	12	31	92	99	61
		Alt 2	12	33	90	67	68
		Alt 3	12	33	88	74	36
OR-44	26,418	No Action	22	33	63	92	98
		Alt 1	22	30	52	89	98
		Alt 2	22	32	55	90	98
		Alt 3	22	34	60	84	46
OR-45	6,651	No Action	41	50	61	91	100
		Alt 1	41	49	58	90	100
		Alt 2	41	49	60	94	99
		Alt 3	41	48	63	83	54
OR-46	226	No Action	80	83	83	83	100
		Alt 1	80	83	83	83	100
		Alt 2	80	66	41	26	31
		Alt 3	80	63	63	26	66
OR-47	25,518	No Action	58	65	72	88	99
		Alt 1	58	64	71	86	98
		Alt 2	58	63	71	89	97
		Alt 3	58	63	65	60	56
OR-48	40,555	No Action	54	65	73	91	99
		Alt 1	54	64	71	89	98
		Alt 2	54	57	64	74	69
		Alt 3	54	60	62	63	56
OR-50	17,657	No Action	54	57	61	89	100
		Alt 1	54	57	61	87	100
		Alt 2	54	56	61	88	97
		Alt 3	54	52	53	67	59

Table 252. Suitable Habitat within Critical Habitat Units OR-51 – OR-60, by alternative

Critical Habitat Unit	Habitat-capable acres	Alternative	% of habitat-capable				
			2006	2016	2026	2056	2106
OR-51	3,640	No Action	35	35	37	67	77
		Alt 1	35	35	37	60	77
		Alt 2	35	32	37	61	50
		Alt 3	35	35	36	73	65
OR-52	33,768	No Action	40	48	59	86	98
		Alt 1	40	48	58	85	98
		Alt 2	40	40	45	59	61
		Alt 3	40	45	49	64	63
OR-53	49,004	No Action	47	51	58	82	91
		Alt 1	47	50	57	77	87
		Alt 2	47	50	58	81	93
		Alt 3	47	46	49	54	52
OR-54	8,183	No Action	49	49	56	84	95
		Alt 1	49	48	57	82	96
		Alt 2	49	47	50	36	29
		Alt 3	49	41	40	57	41
OR-55	15,799	No Action	61	64	71	90	99
		Alt 1	61	64	69	88	99
		Alt 2	61	44	43	40	33
		Alt 3	61	64	71	91	59
OR-56	6,031	No Action	56	55	58	70	79
		Alt 1	56	54	57	63	78
		Alt 2	56	51	36	22	22
		Alt 3	56	49	41	30	39
OR-57	9,848	No Action	59	60	61	71	82
		Alt 1	59	60	61	71	79
		Alt 2	59	41	29	19	20
		Alt 3	59	52	41	26	32
OR-58	48,334	No Action	54	57	60	87	96
		Alt 1	54	57	61	85	95
		Alt 2	54	56	59	85	94
		Alt 3	54	53	49	59	40
OR-59	4,728	No Action	59	61	63	79	86
		Alt 1	59	61	63	76	90
		Alt 2	59	56	56	26	20
		Alt 3	59	56	44	27	40
OR-60	68,751	No Action	52	57	65	86	93
		Alt 1	52	56	62	84	92
		Alt 2	52	55	60	72	76
		Alt 3	52	56	61	76	52

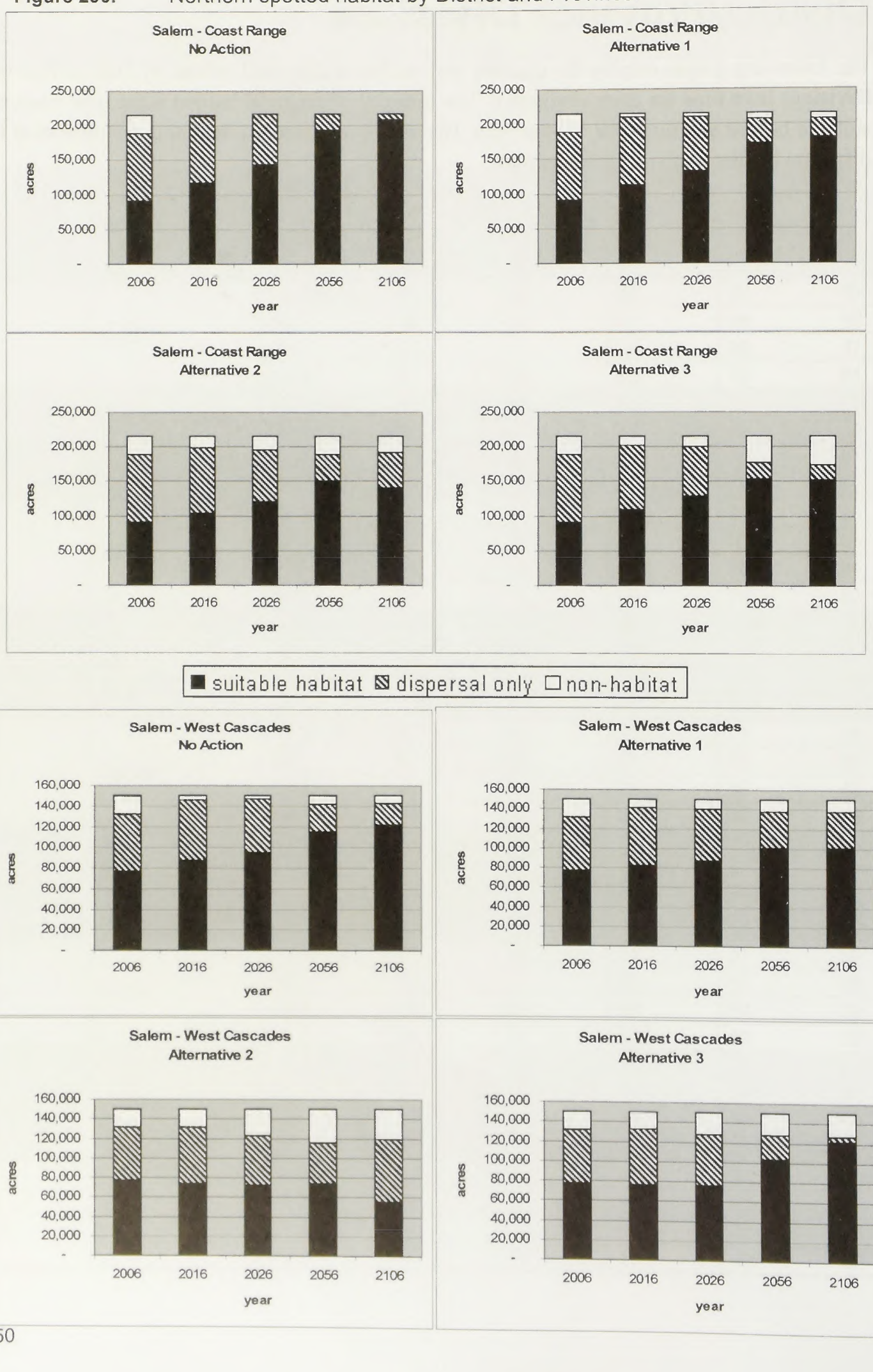
Table 253. Suitable Habitat within Critical Habitat Units OR-61 – OR-76, by alternative

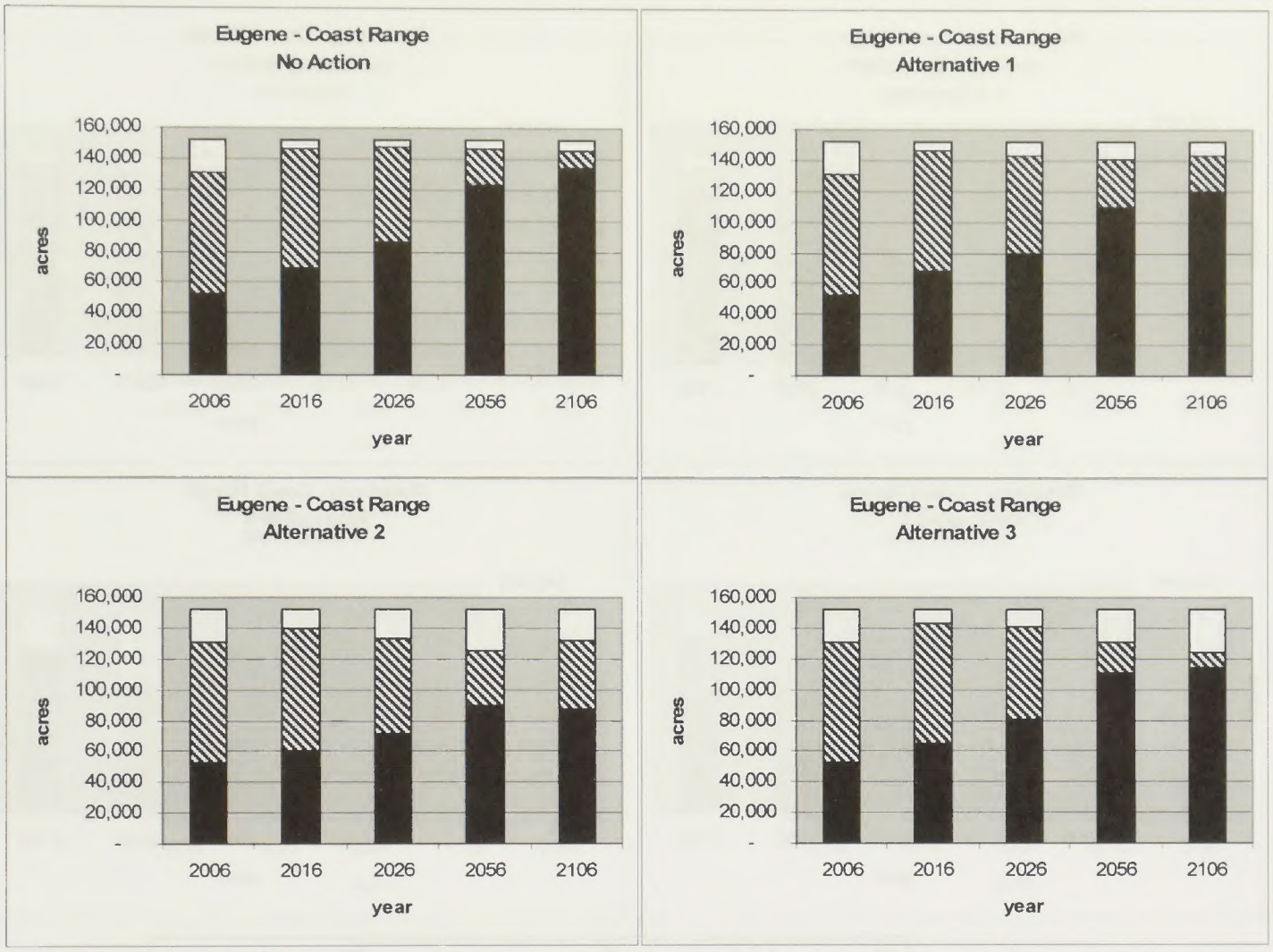
Critical Habitat Unit	Habitat-capable acres	Alternative	% of habitat-capable				
			2006	2016	2026	2056	2106
OR-61	2,462	No Action	71	72	77	83	96
		Alt 1	71	72	78	84	100
		Alt 2	71	60	57	20	13
		Alt 3	71	59	55	14	10
OR-62	45,760	No Action	59	61	61	71	89
		Alt 1	59	61	62	69	87
		Alt 2	59	60	62	71	91
		Alt 3	59	54	51	57	41
OR-63	8,004	No Action	66	64	65	61	59
		Alt 1	66	64	61	46	50
		Alt 2	66	51	39	30	37
		Alt 3	66	66	65	76	61
OR-64	5,338	No Action	60	56	59	63	70
		Alt 1	60	57	53	45	39
		Alt 2	60	43	35	34	41
		Alt 3	60	57	58	57	42
OR-65	82,184	No Action	74	77	78	83	90
		Alt 1	74	77	77	83	89
		Alt 2	74	75	76	80	84
		Alt 3	74	71	70	72	62
OR-66	4	No Action	100	100	100	100	100
		Alt 1	100	100	100	100	100
		Alt 2	100	100	100	100	100
		Alt 3	100	100	100	100	100
OR-67	18,555	No Action	61	60	70	77	75
		Alt 1	61	59	68	73	58
		Alt 2	61	54	56	56	41
		Alt 3	61	56	64	66	55
OR-72	48,573	No Action	70	76	78	86	93
		Alt 1	70	74	76	81	91
		Alt 2	70	74	75	77	79
		Alt 3	70	61	55	53	62
OR-74	26,891	No Action	55	63	64	57	59
		Alt 1	55	57	58	51	48
		Alt 2	55	58	62	52	39
		Alt 3	55	52	52	42	57
OR-75	16,985	No Action	47	56	55	43	57
		Alt 1	47	48	50	37	41
		Alt 2	47	48	52	43	40
		Alt 3	47	48	46	38	60
OR-76	418	No Action	86	91	94	94	100
		Alt 1	86	83	82	23	11
		Alt 2	86	48	82	86	95
		Alt 3	86	89	85	40	62

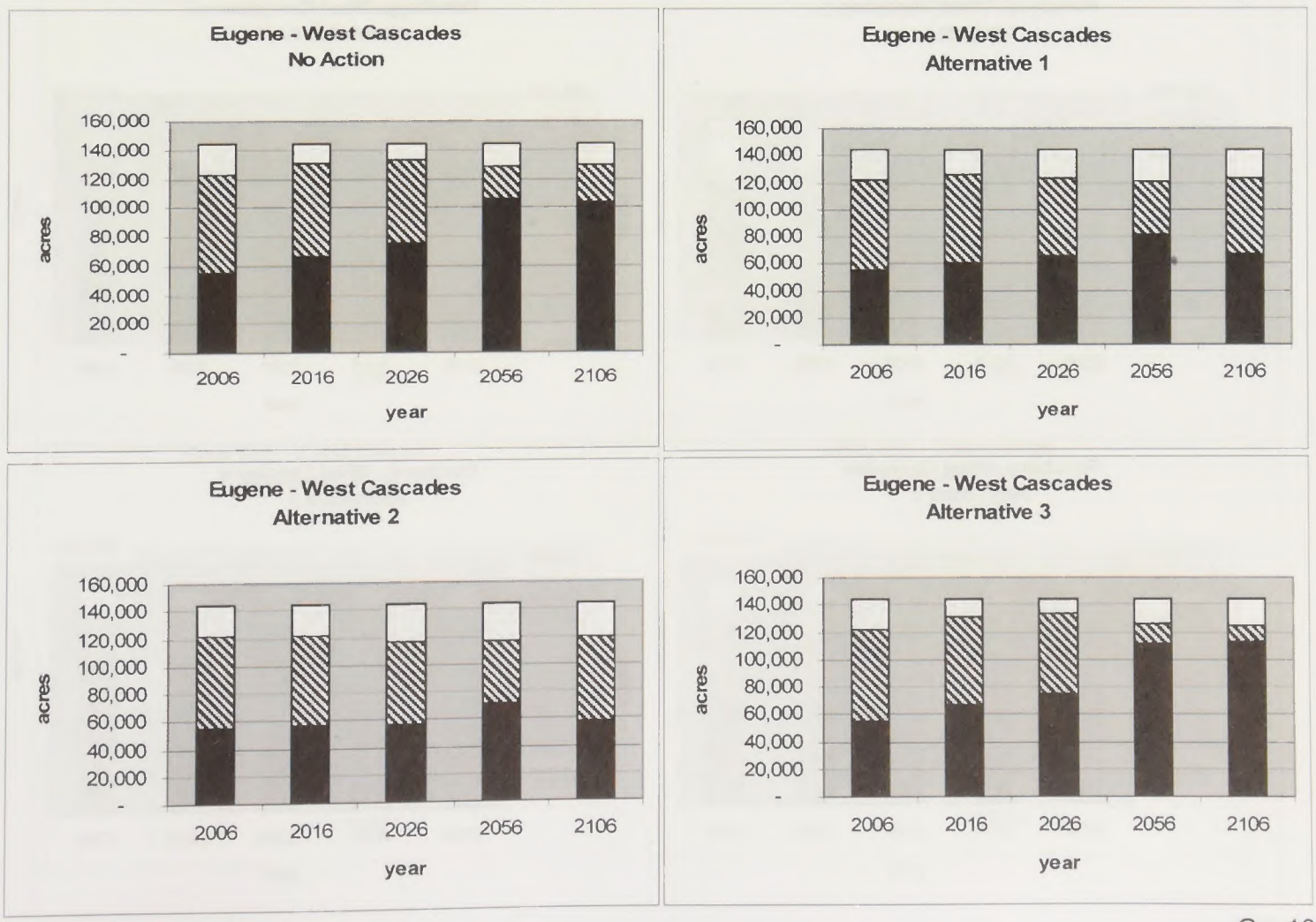
Northern Spotted Owl Dispersal Habitat by District/Province Divisions

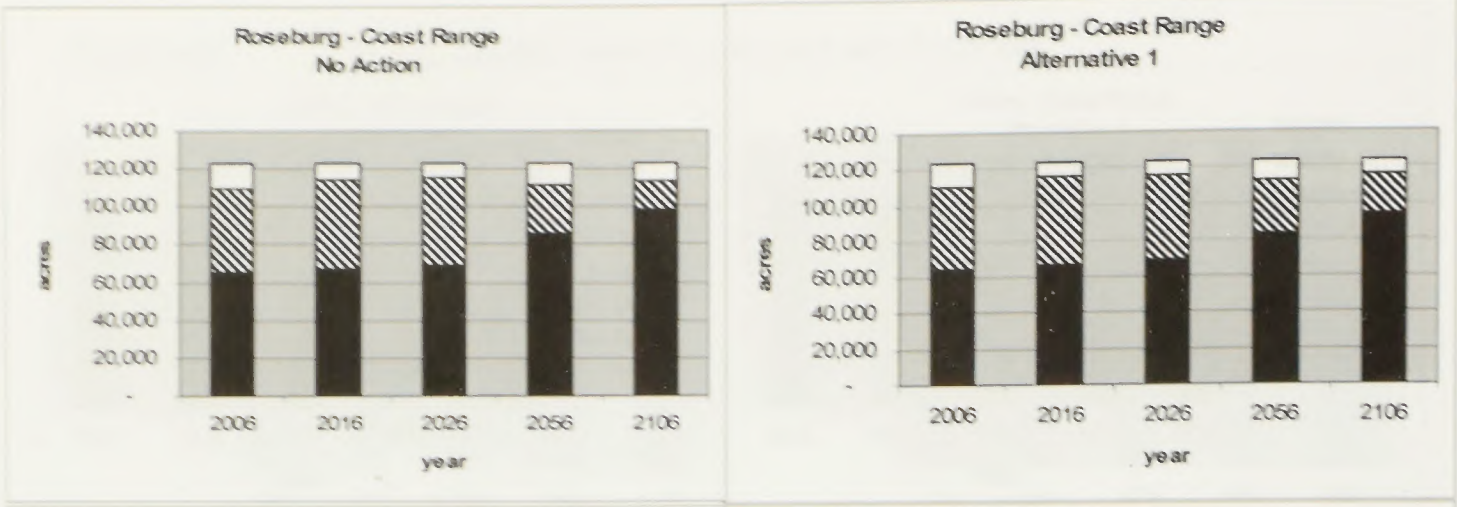
The following graphs display the quantity and quality of dispersal habitat by District/Province Divisions over time for each alternative. The quantity of dispersal habitat is the total amount of suitable habitat and dispersal habitat only. The quality of dispersal habitat is the portion of total dispersal habitat that is suitable habitat.

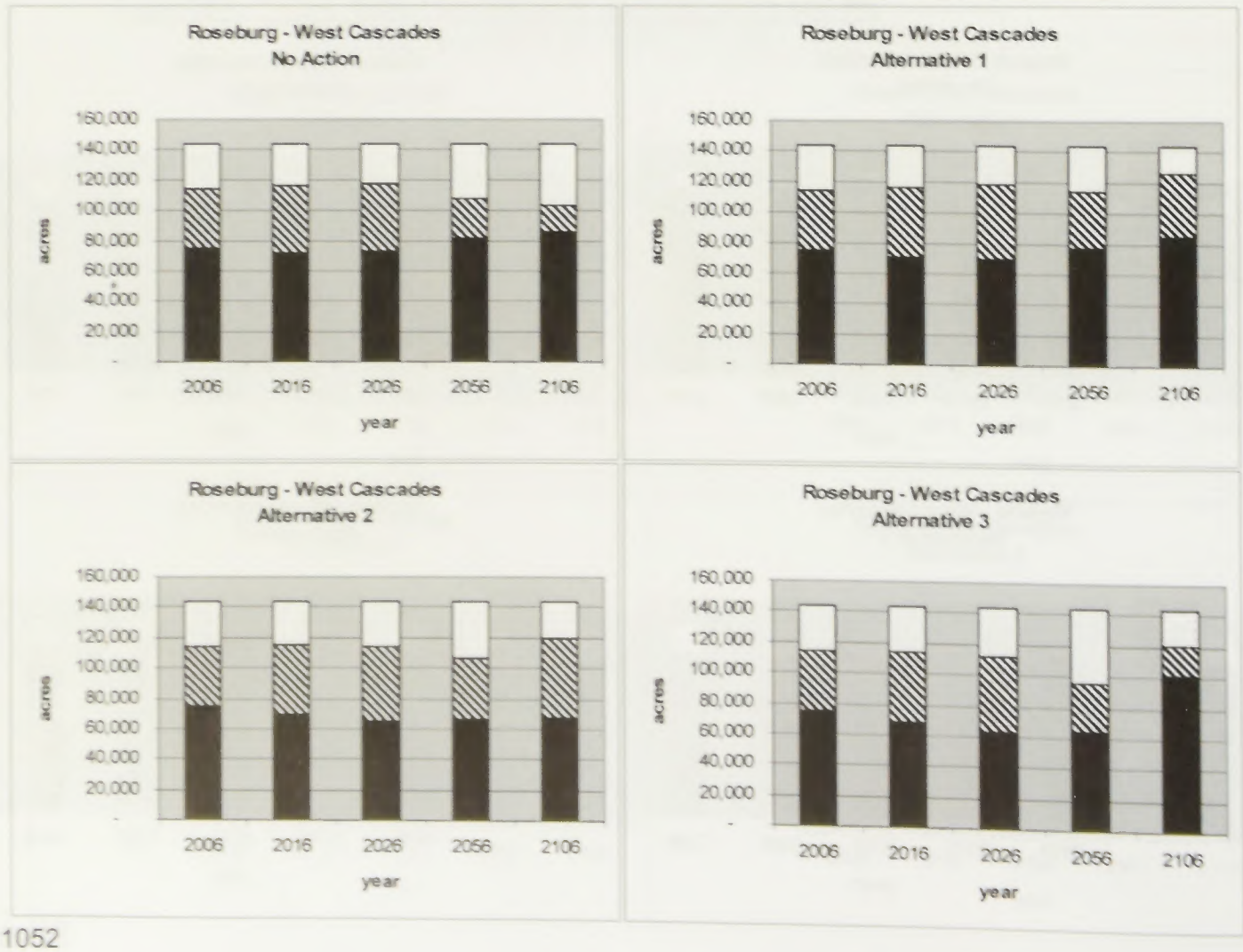
Figure 290. Northern spotted habitat by District and Province.

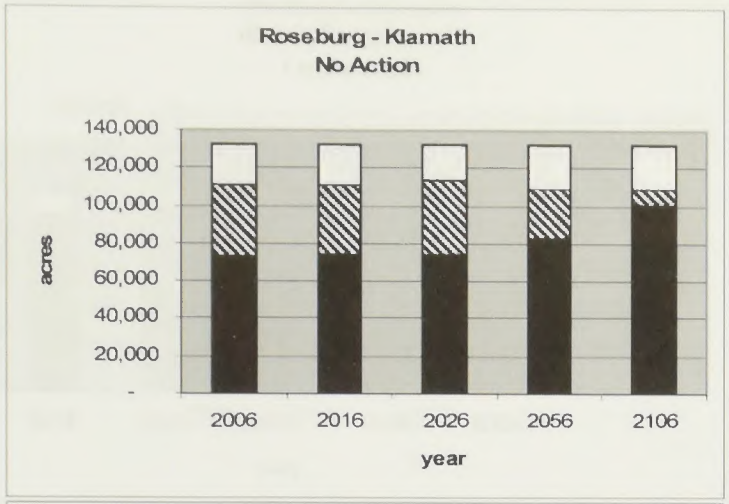


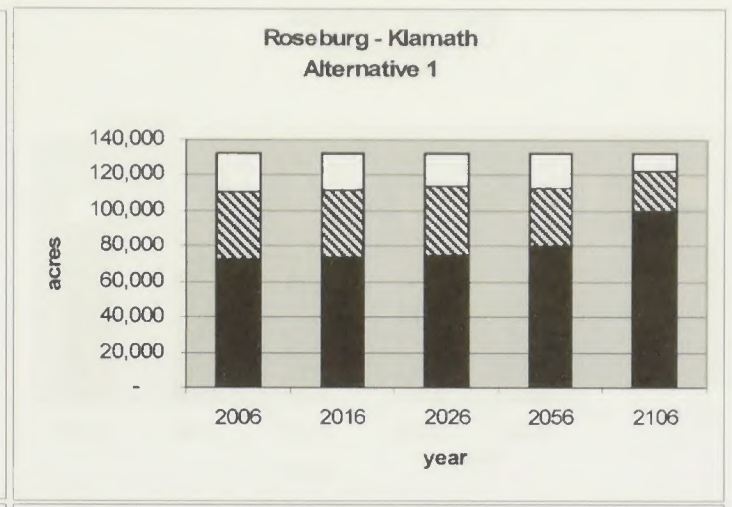

Eugene - Coast Range
No Action
Eugene - Coast Range
Alternative 1
Eugene - Coast Range
Alternative 2
Eugene - Coast Range
Alternative 3
acres
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
2006
2016
2026
2056
2106
year
suitable habitat
dispersal only
non-habitat

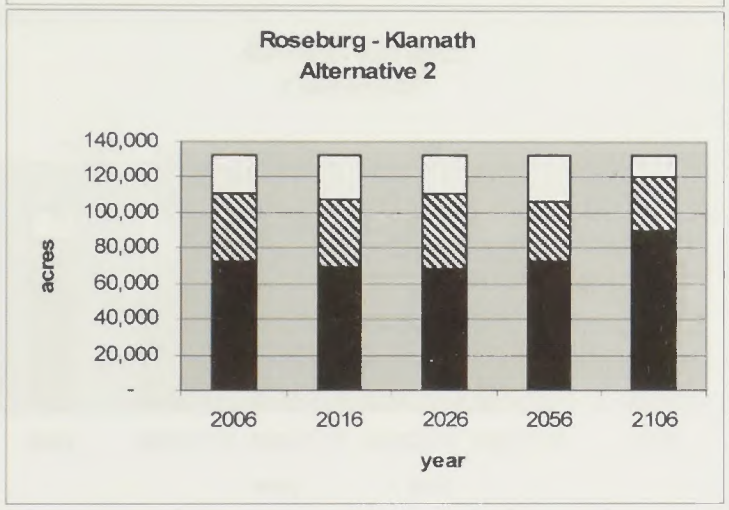

Eugene - West Cascades
No Action
Eugene - West Cascades
Alternative 1
Eugene - West Cascades
Alternative 2
Eugene - West Cascades
Alternative 3
acres
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
2006
2016
2026
2056
2106
year

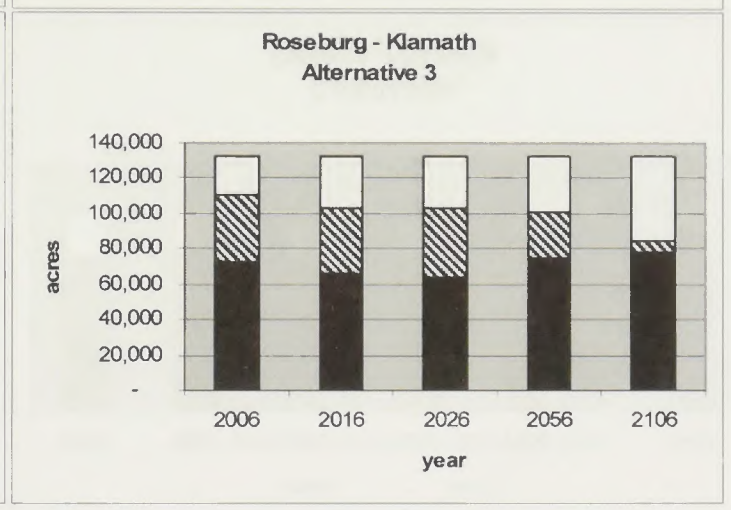

Roseburg - Coast Range
No Action
Roseburg - Coast Range
Alternative 1
Roseburg - Coast Range
Alternative 2
Roseburg - Coast Range
Alternative 3
acres
year
2006
2016
2026
2056
2106
suitable habitat
dispersal only
non-habitat


Roseburg - West Cascades
No Action
Roseburg - West Cascades
Alternative 1
Roseburg - West Cascades
Alternative 2
Roseburg - West Cascades
Alternative 3
acres
year
2006
2016
2026
2056
2106

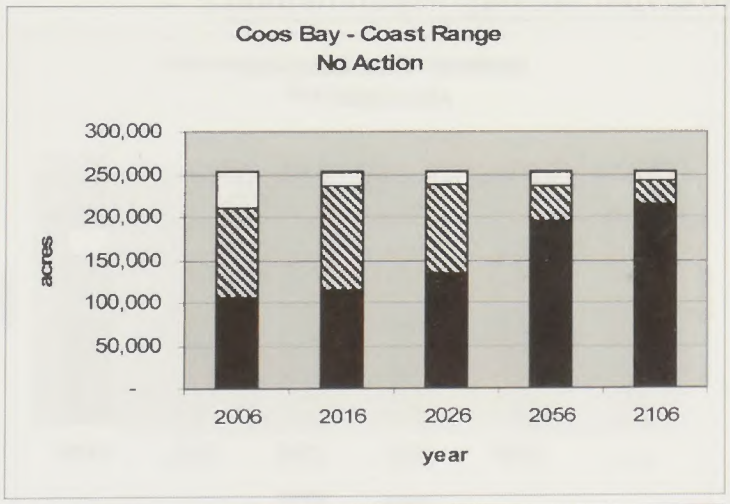


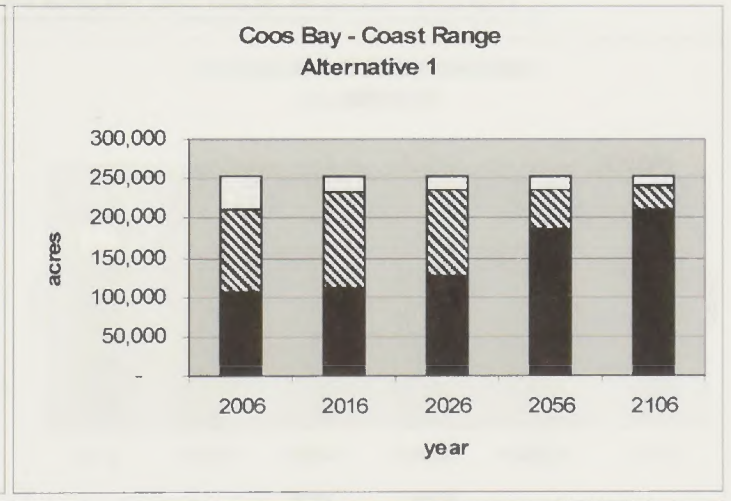


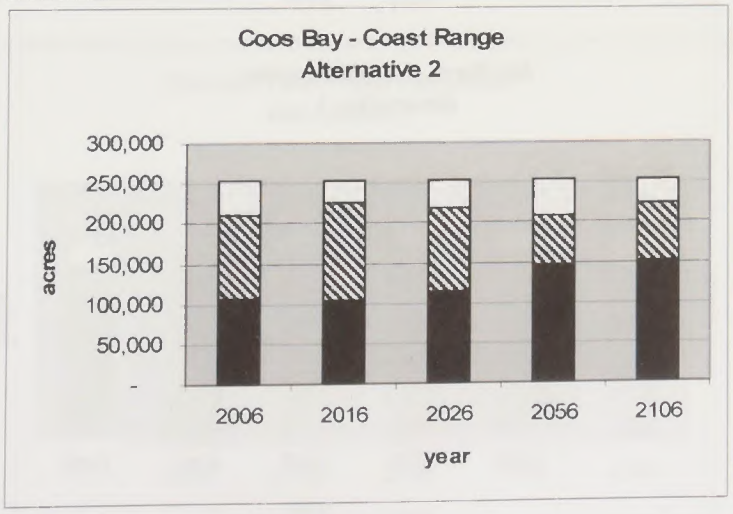


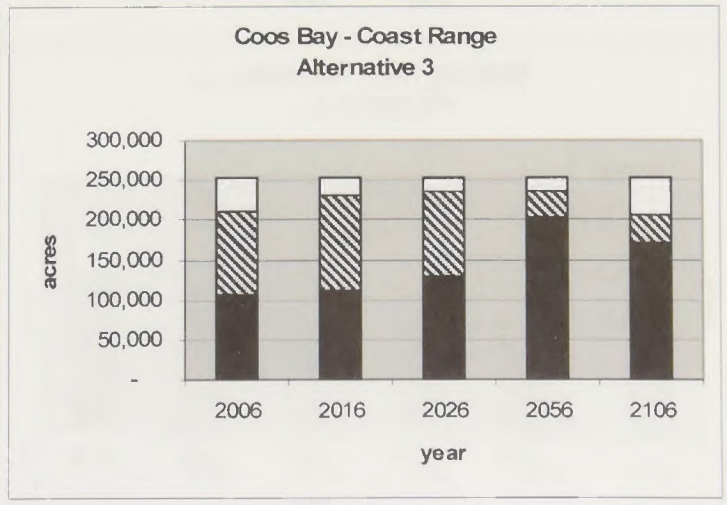


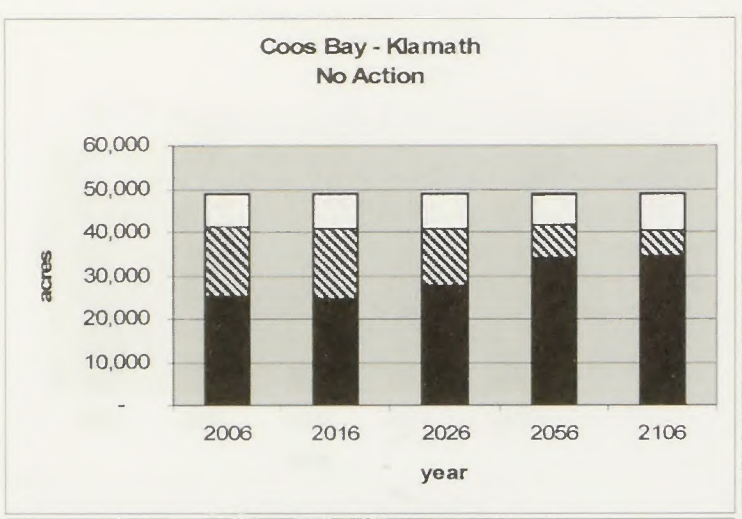
suitable habitat | dispersal only | non-habitat

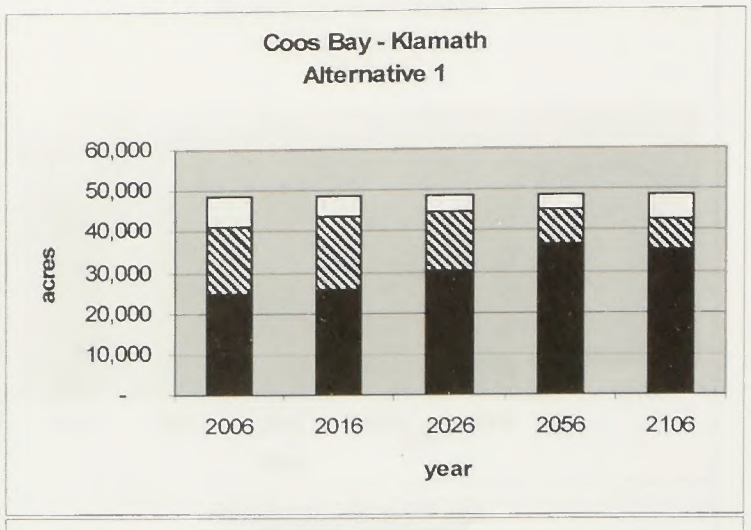


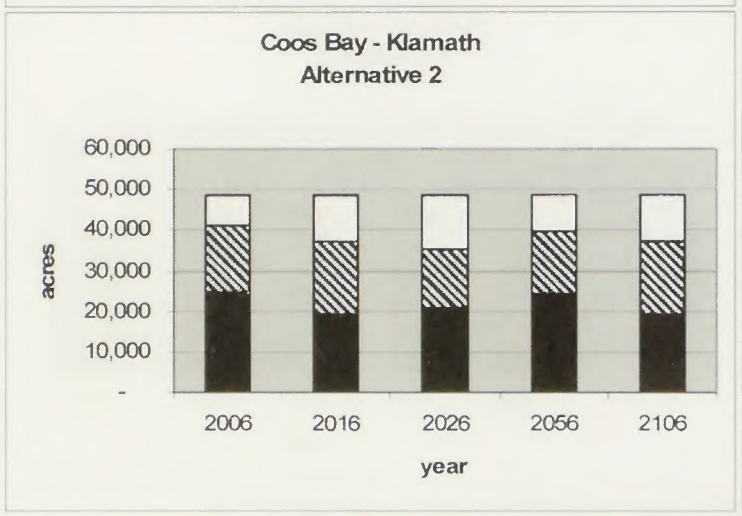


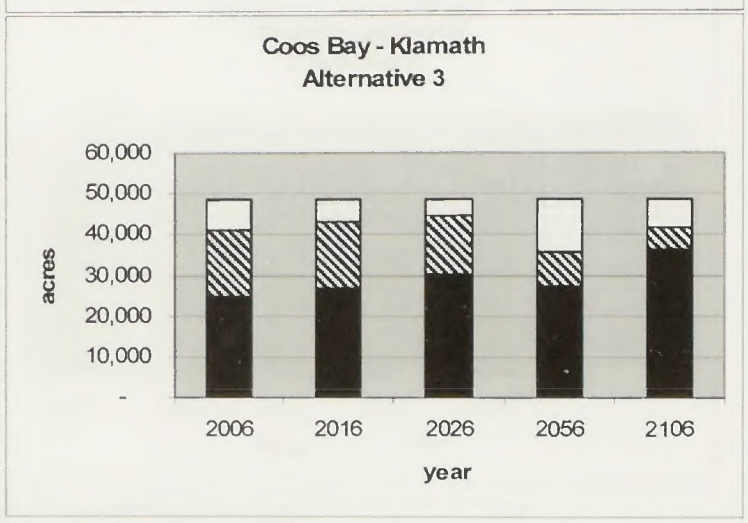


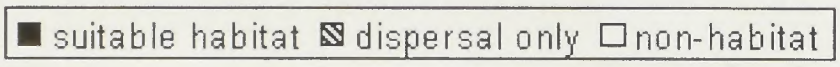


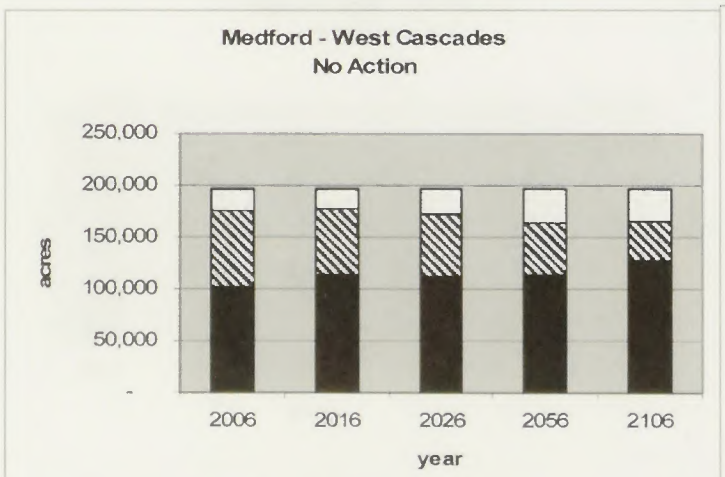

Coos Bay - Klamath
No Action
60,000
50,000
40,000
30,000
20,000
10,000
-
acres
2006
2016
2026
2056
2106
year

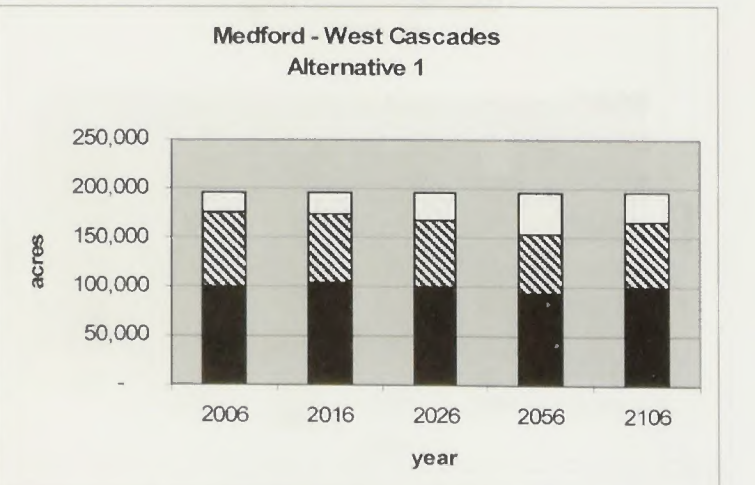

Coos Bay - Klamath
Alternative 1
60,000
50,000
40,000
30,000
20,000
10,000
-
acres
2006
2016
2026
2056
2106
year

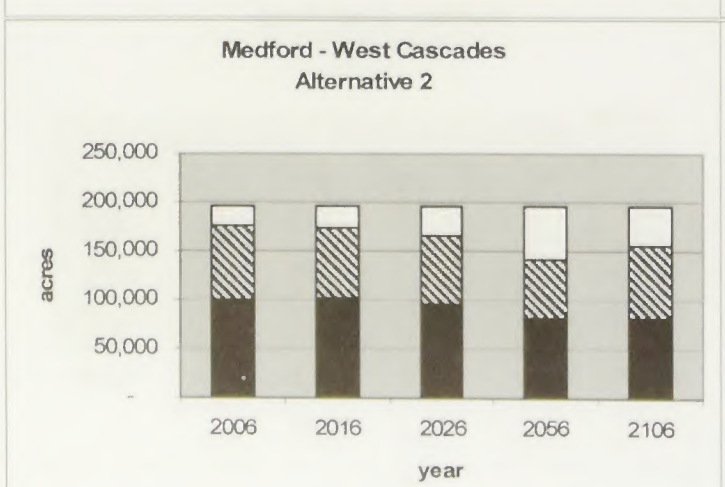

Coos Bay - Klamath
Alternative 2
60,000
50,000
40,000
30,000
20,000
10,000
-
acres
2006
2016
2026
2056
2106
year

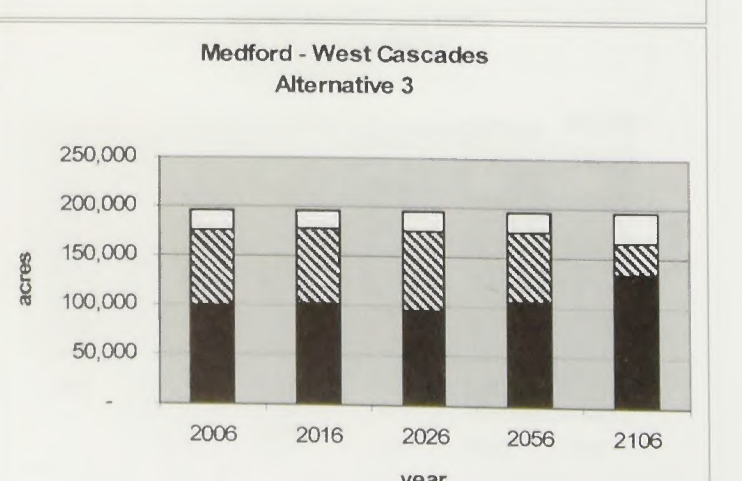

Coos Bay - Klamath
Alternative 3
60,000
50,000
40,000
30,000
20,000
10,000
-
acres
2006
2016
2026
2056
2106
year

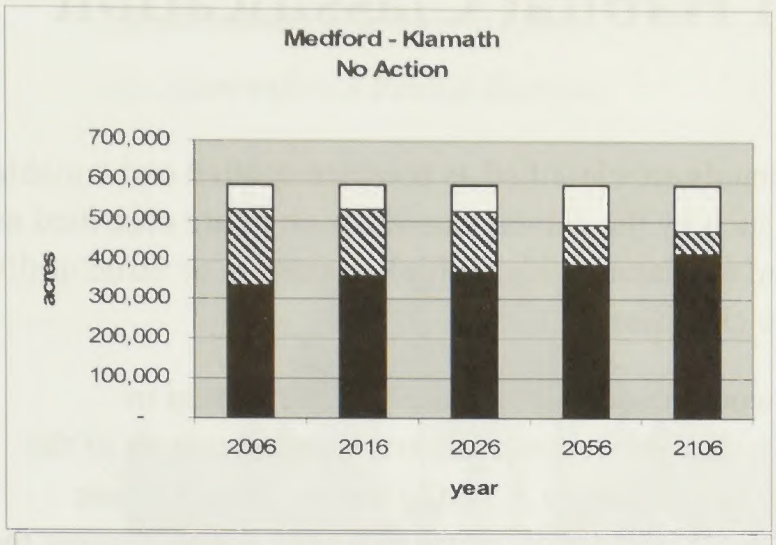

suitable habitat
dispersal only
non-habitat

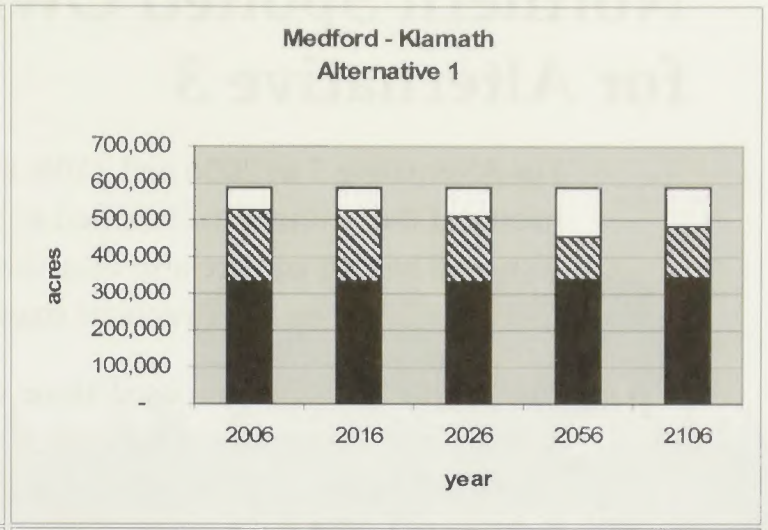

Medford - West Cascades
No Action
250,000
200,000
150,000
100,000
50,000
-
acres
2006
2016
2026
2056
2106
year

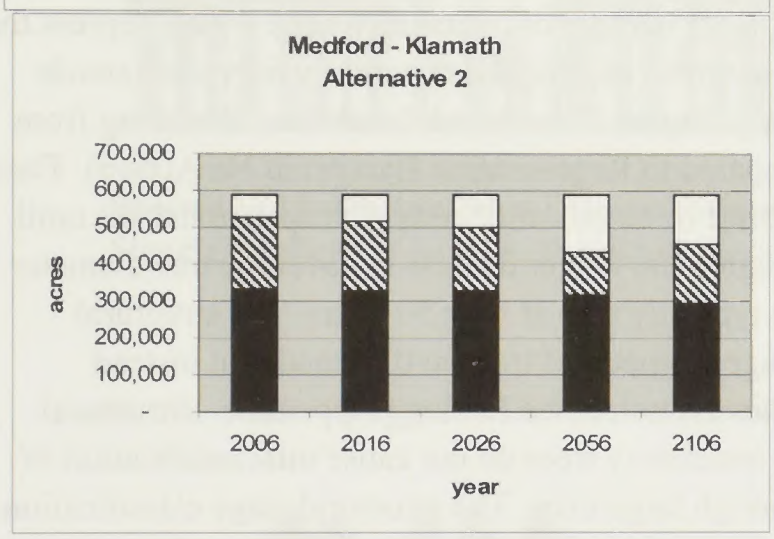

Medford - West Cascades
Alternative 1
250,000
200,000
150,000
100,000
50,000
-
acres
2006
2016
2026
2056
2106
year

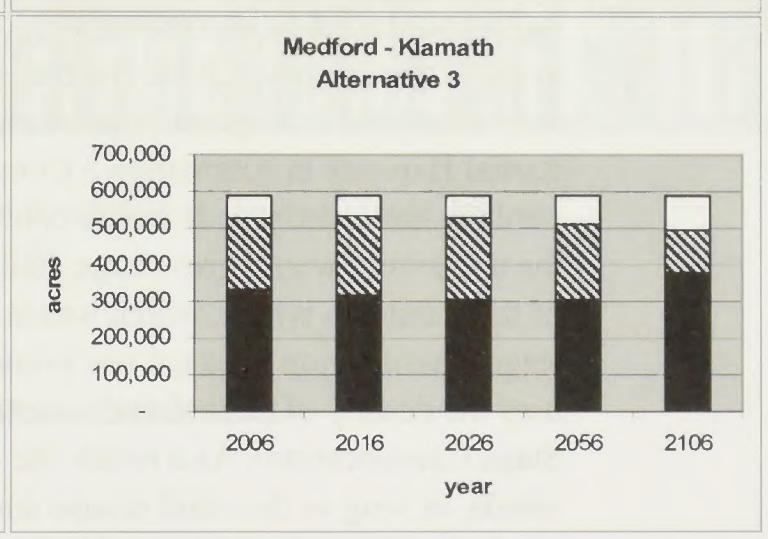

Medford - West Cascades
Alternative 2
250,000
200,000
150,000
100,000
50,000
-
acres
2006
2016
2026
2056
2106
year

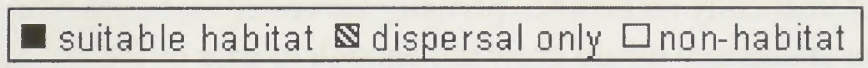

Medford - West Cascades
Alternative 3
250,000
200,000
150,000
100,000
50,000
-
acres
2006
2016
2026
2056
2106
year

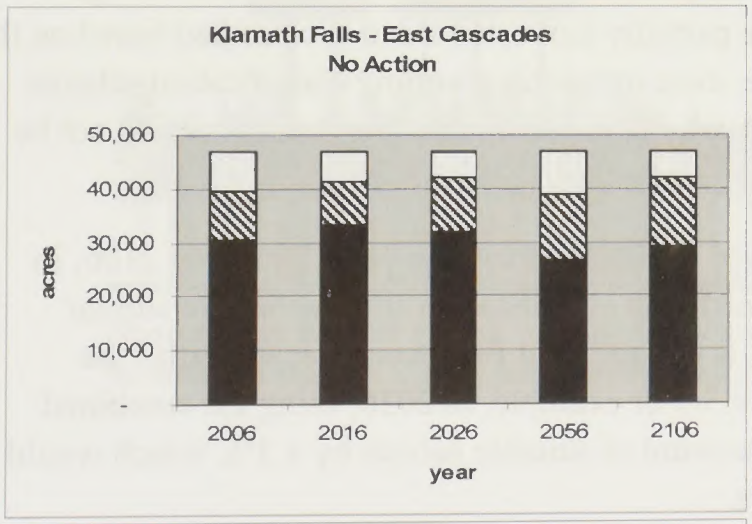

Medford - Klamath
No Action
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
acres
2006
2016
2026
2056
2106
year

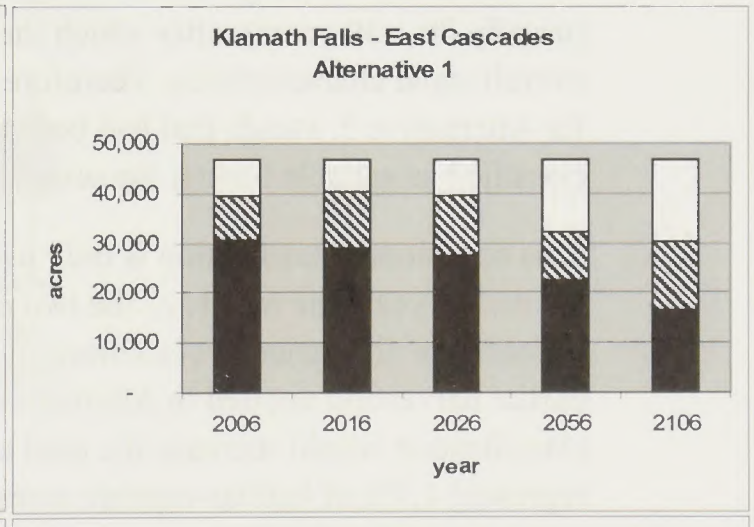

Medford - Klamath
Alternative 1
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
acres
2006
2016
2026
2056
2106
year

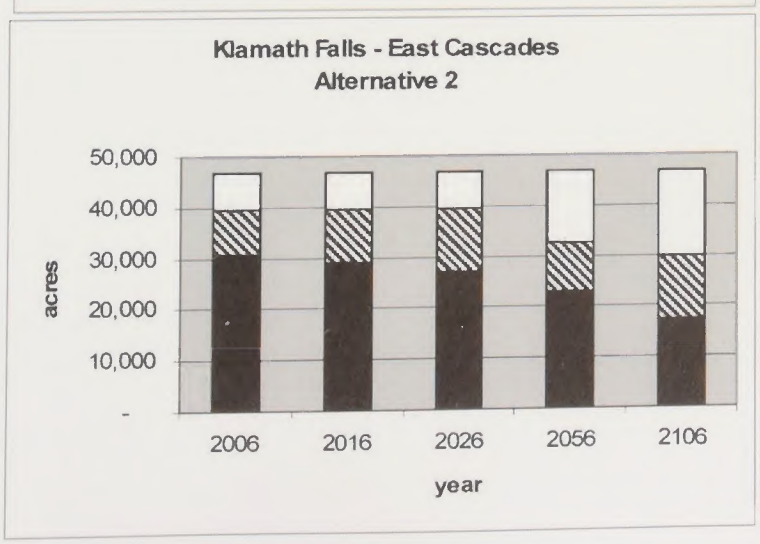

Medford - Klamath
Alternative 2
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
acres
2006
2016
2026
2056
2106
year

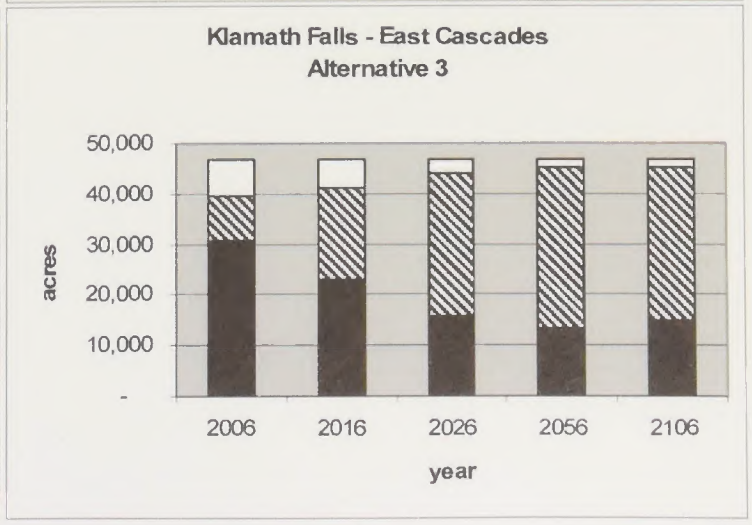

Medford - Klamath
Alternative 3
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
acres
2006
2016
2026
2056
2106
year


suitable habitat
dispersal only
non-habitat


Klamath Falls - East Cascades
No Action
50,000
40,000
30,000
20,000
10,000
-
acres
2006
2016
2026
2056
2106
year


Klamath Falls - East Cascades
Alternative 1
50,000
40,000
30,000
20,000
10,000
-
acres
2006
2016
2026
2056
2106
year


Klamath Falls - East Cascades
Alternative 2
50,000
40,000
30,000
20,000
10,000
-
acres
2006
2016
2026
2056
2106
year


Klamath Falls - East Cascades
Alternative 3
50,000
40,000
30,000
20,000
10,000
-
acres
2006
2016
2026
2056
2106
year

Northern Spotted Owl Habitat Classification for Alternative 3

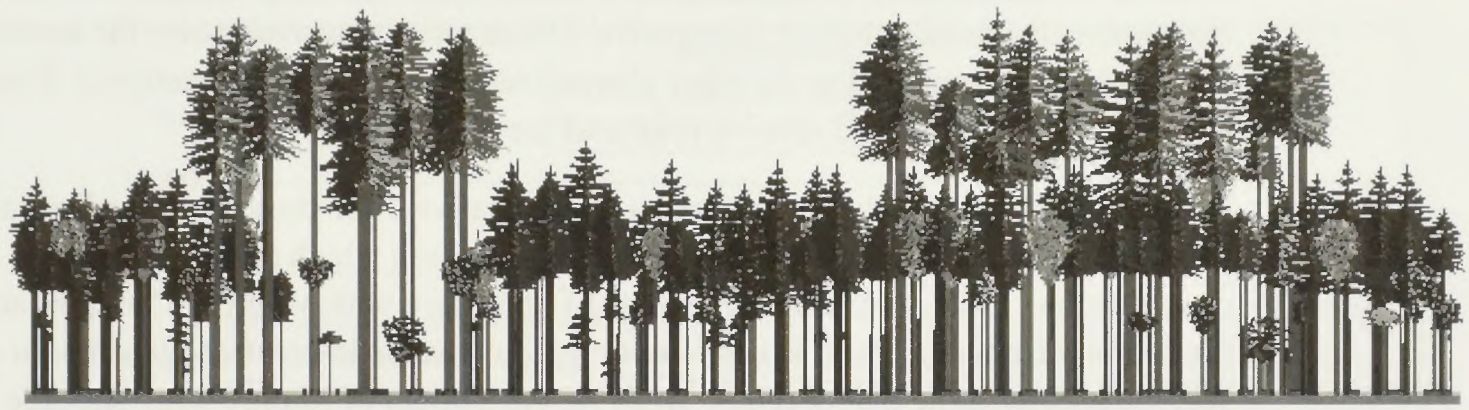
For Alternative 3 in 2056 and 2106, stands are classified as northern spotted owl suitable habitat if they either are classified as such by the habitat classification or are classified as dispersal habitat and are also classified as Mature with Multiple Canopies or Structurally Complex forest by the structural stage classification.

The habitat classification used alone would underestimate the suitable habitat in Alternative 3, because the habitat classification depends in part on measurement of the average diameter of trees in the stand. In Alternative 3, partial harvest would create multi-cohort stands, and the resultant large number of understory trees would depress the average tree diameter of the stand as a whole, causing these partially harvested stands to be classified as dispersal habitat only (Figure 291 - Stand Conditions Resulting from Partial Harvests in Alternative 3 Compared to Regeneration Harvest in No Action). These partially harvested stands would continue to be classified only as dispersal habitat until the understory would grow large enough to no longer depress the average tree diameter of the stand as a whole, which would typically take at least 50 years. The struetural stage classification does not use average diameter of trees in the stand, but instead uses the density of trees above a certain diameter (see Ecology Appendix – Structural Stage Classification). As a result, the understory trees do not cause misclassification of stands, as long as the stand retains enough large trees. The structural stage classification automatically reclassifies partially harvested stands to Stand Establishment forest until the understory would grow tall enough to pass out of the Stand Establishment stage (usually 20 – 30 years), after which the partially harvested stand is classified based on the overall stand characteristics. Therefore, even using this combing classification scheme for Alternative 3, stands that had been partially harvested in Alternative 3 would not be classified as suitable habitat for several decades after partial harvest.

This combined classification is only used for results from the years 2056 and 2106; in the earlier years the results of the two different classification approaches are similar because the difference in classification is not apparent for several decades after the partial harvesting applied in Alternative 3. For example, in 2026, using the combined classification would increase the total amount of suitable habitat by 3.3%, which would represent 1.7% of habitat-capable acres.

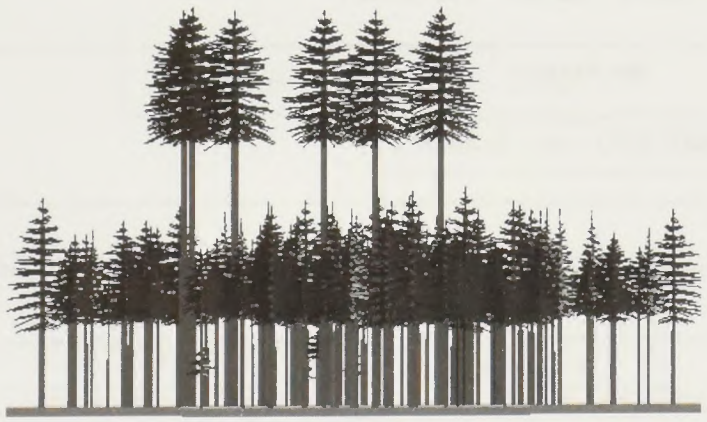
Figure 291. Stand Conditions Resulting from Partial Harvests in Alternative 3 Compared to Regeneration Harvest in No Action

A. Alternative 3 Partial Harvest



Spotted owl habitat rating = Dispersal habitat (according to standard classification)
Structural stage = Mature with multiple canopies

B. No Action - Regeneration Harvest with Green Tree Retention

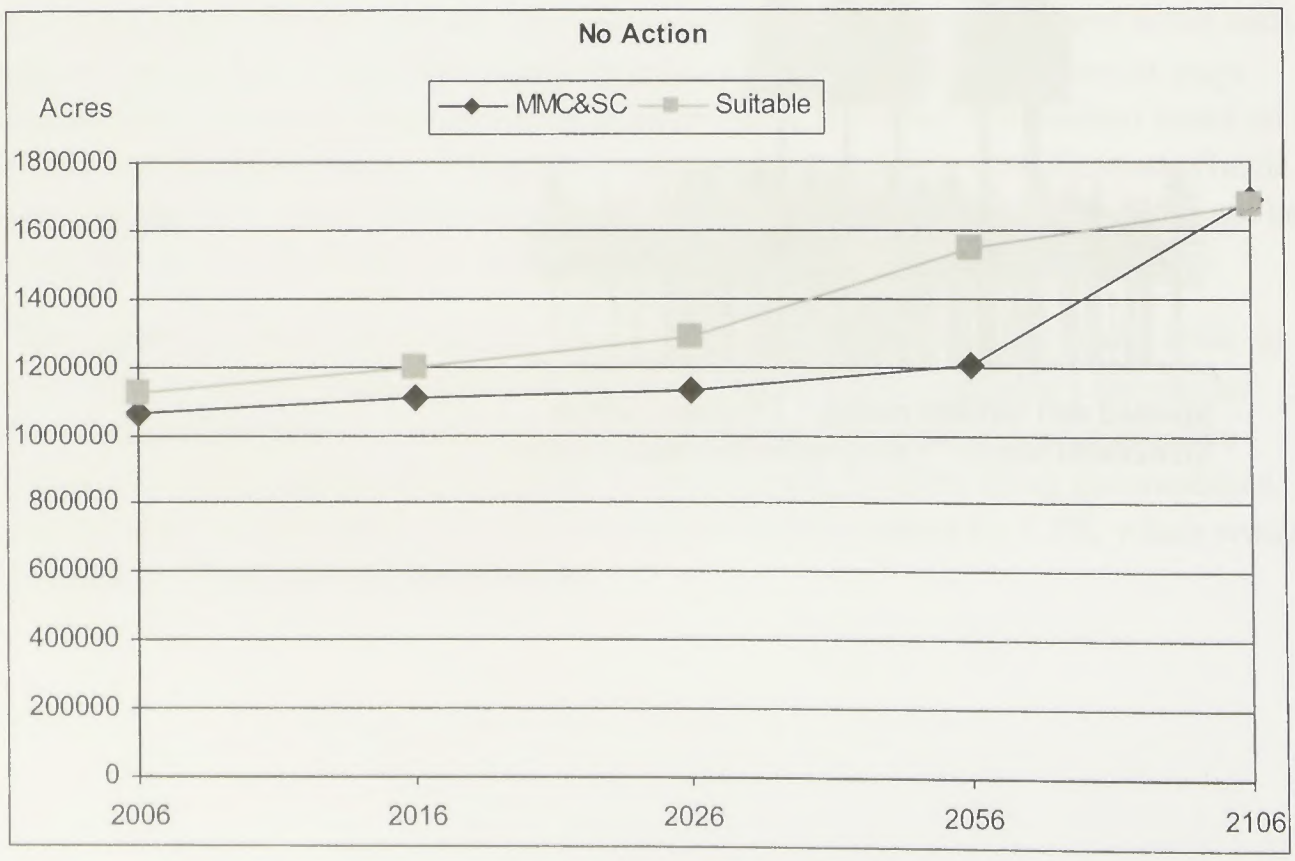


Spotted owl habitat rating = Dispersal habitat
Structural stage = Young with Structural Legacy

The combined classification might be expected to overestimate the amount of suitable habitat compared to other alternatives, because it expands the definition of suitable habitat wider than the other alternatives. However, in No Action, Alternative 1, and Alternative 2, Mature with Multiple Canopies and Structurally Complex forest is generally a subset of suitable habitat: the amount of Mature with Multiple Canopies and Structurally Complex forest is always lower than the amount of suitable habitat. Therefore, it is unlikely that the combined classification for Alternative 3 substantially overestimates the amount of suitable habitat compared to the other alternatives, and does not overestimate it enough to alter the overall trends and relative results of the alternatives.

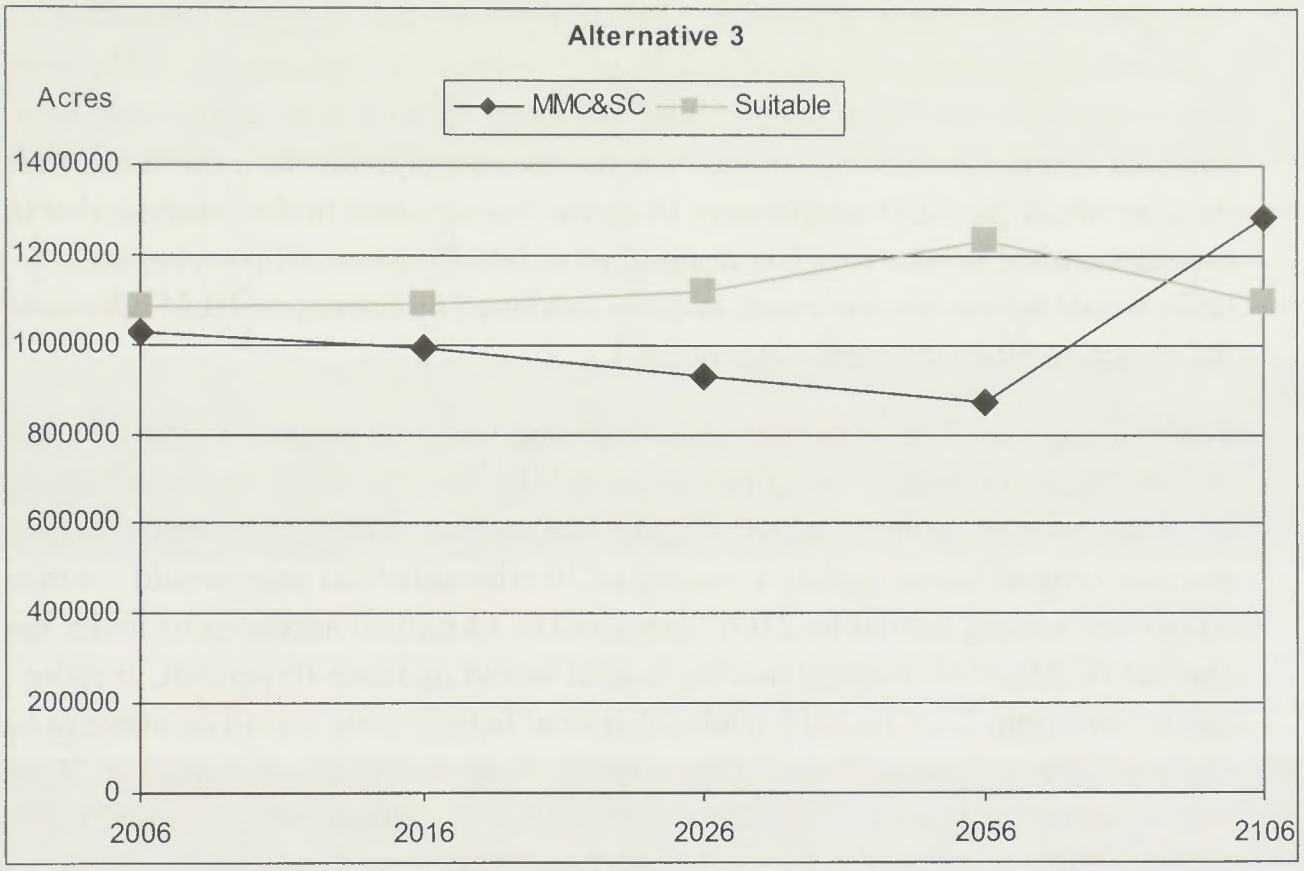
No Action provides the best comparison to Alternative 3 for classification of suitable habitat, because No Action includes green tree retention which complicated the classification. Under No Action, the amount of Mature with Multiple Canopies and Structurally Complex forest is very similar to, but always lower, than the amount of suitable habitat in the first decades. In 2056, the amount of Mature with Multiple Canopies and Structurally Complex forest is more substantially lower than the amount of suitable habitat. But in 2056, Mature with Multiple Canopies and Structurally Complex forest is very strongly a subset of suitable habitat: 93% of Mature with Multiple Canopies forest and 94% of Structurally Complex forest in 2056 under No Action is also classified as suitable habitat.

Figure 292. Comparison of Classification of Mature with Multiple Canopies and Structurally Complex Forest with Classification of Suitable Habitat – No Action



This close correlation between Mature with Multiple Canopies and Structurally Complex forest and suitable habitat in No Action, Alternative 1, and Alternative 2, is in contrast to the poor correlation between the two classifications in Alternative 3. Note that the two classifications have a different trend over time under Alternative 3.

Figure 293. Comparison of Classification of Mature with Multiple Canopies and Structurally Complex Forest with Classification of Suitable Habitat – Alternative 3



Marbled Murrelet Critical Habitat.

There are 29 marbled murrelet critical habitat units that include BLM administered lands. Critical habitat was designated by the U.S. Fish and Wildlife Service in 1996 to encompass existing Late-successional Reserves, as defined in the Northwest Forest Plan. Critical habitat units would be managed as late-successional reserves under the no action alternative and as late-successional management areas under alternative 1. By 2106 under the no action alternative and alternative 1, BLM administered lands in 14 and 19 of 29 critical habitat units would be comprised of more than 90 percent murrelet nesting habitat. All except one of these units would have increasing amounts of murrelet nesting habitat. The one exception to this upward trend would be unit CA-01-e, in which the BLM administers 14 acres. It is assumed in this analysis that the marbled murrelet critical habitat which is designated as late-successional reserves on U.S. Forest Service lands would follow similar trends to those exhibited by habitat on BLM administered lands under the no action alternative and Alternative 1.

Marbled murrelet nesting habitat would increase under alternative 2 from 218,000 acres to 287,000 acres, or from 47 to 63 percent of habitat capable forest in critical habitat units. The late-successional management areas under alternative 2 would not completely encompass marbled murrelet critical habitat and as a result 6 of 29 critical habitat units would contain greater than 90 percent nesting habitat by 2106, compared to 14 critical habitat units under the no action alternative. Marbled murrelet nesting habitat would increase 10 percent, or more, in one critical habitat unit from 2006 to 2016 while 20 critical habitat units would decrease in habitat during this time period. Nine of these 20 units would decrease in habitat more than 10 percent. Nesting habitat would decrease between 2016 and 2026 in 20 critical habitat units. Two of these 20 critical habitat units would decrease more than 10 percent. From 2006 to 2106, marbled murrelet nesting habitat would increase in 14 critical habitat units. Thirteen of these 14 critical habitat units would increase in habitat more than 10 percent. Murrelet nesting habitat would decrease in 15 critical habitat units, 10 of these units would decrease more than 10 percent.

Marbled murrelet nesting habitat would increase under alternative 3 from 217,000 acres to 269,000 acres, or from 47 to 59 percent of habitat-capable forest on BLM administered lands.

Under alternative 3, with the exception of Congressionally-withdrawn lands and riparian management areas, almost all marbled murrelet critical habitat units would be subject to regeneration harvests and partial harvests that would remove marbled murrelet nesting habitat. Under alternative 3, there would be 3 of 29 critical habitat units which would contain greater than 90 percent nesting habitat by 2106, compared to 14 units under the no action alternative and 19 units under alternative 1 and 6 units under alternative 2. Under alternative 3, marbled murrelet nesting habitat would increase more than 10 percent in one critical habitat unit from 2006 to 2106 while habitat would decrease in 14 critical habitat units in the first decade. Three of these 14 units would decrease more than 10 percent. Nesting habitat would decrease between 2016 and 2026 in 23 critical habitat units. One of these 23 units would decrease more than 10 percent. From 2006 to 2106, marbled murrelet nesting habitat would increase in 20 critical habitat units, in 10 of these units habitat would increase more than 10 percent, while habitat would decrease in 9 critical habitat units, habitat would decrease more than 10 percent in two of those nine units. Although alternative 3 opens almost all of the critical habitat units to vegetative management compared

to alternative 2, retention tree requirements in both the partial and regeneration harvests provide for mueh more rapid redevelopment of murrelet nesting habitat. Murrelet nesting habitat would develop up to 70 years sooner in alternative 3 eompared to alternative 2, beeause of the role of retention trees in habitat development.

Table 254. Marbled murrelet nesting habitat summarized by critical habitat unit and alternative.

Critical Habitat Unit	Alternative	Habitat-capable (ac)	Marbled murrelet nesting habitat (ac)				
			2006	2016	2026	2056	2106
CA-01-e	Alt 1	14	10	7	6	10	8
	Alt 2	14	10	3	3	9	7
	Alt 3	14	10	10	10	8	12
	No Action	14	10	14	14	14	9
OR-01-b	Alt 1	1	1	1	1	1	1
	Alt 2	1	1	1	1	1	1
	Alt 3	1	1	1	1	1	1
	No Action	1	1	1	1	1	1
OR-01-c	Alt 1	7217	4472	4874	4903	5089	5680
	Alt 2	7217	4472	4340	3973	2991	3076
	Alt 3	7217	4472	4792	4465	3081	4497
	No Action	7217	4472	4873	4903	5089	5297
OR-02-a	Alt 1	0	0	0	0	0	0
	Alt 2	0	0	0	0	0	0
	Alt 3	0	0	0	0	0	0
	No Action	0	0	0	0	0	0
OR-02-b	Alt 1	11	1	1	1	1	4
	Alt 2	11	1	1	1	1	1
	Alt 3	11	1	1	1	1	1
	No Action	11	1	1	1	1	1
OR-02-c	Alt 1	3139	969	1332	1557	1910	2742
	Alt 2	3139	969	985	1206	1355	2148
	Alt 3	3139	969	1027	963	557	1077
	No Action	3139	969	1332	1557	1910	2114
OR-02-d	Alt 1	25584	4948	6082	6700	9143	23955
	Alt 2	25584	4948	6579	7391	11258	23667
	Alt 3	25584	4948	7041	7414	10653	17785
	No Action	25584	4948	6874	8201	14458	23688
OR-02-e	Alt 1	37256	13750	16475	17692	20158	34639
	Alt 2	37256	13750	15532	16625	18578	31857
	Alt 3	37256	13750	14709	13997	9737	18669
	No Action	37256	13750	16613	17883	20232	30462

Critical Habitat Unit	Alternative	Habitat-capable (ac)	Marbled murrelet nesting habitat (ac)				
			2006	2016	2026	2056	2106
OR-03-a	Alt 1	39	39	41	41	41	41
	Alt 2	39	39	39	39	39	39
	Alt 3	39	39	39	39	15	15
	No Action	39	39	41	41	41	41
OR-03-c	Alt 1	8087	3158	3992	3819	4165	7892
	Alt 2	8087	3158	3593	3521	4100	6786
	Alt 3	8087	3158	3624	3652	3188	5207
	No Action	8087	3158	3988	4051	5047	7542
OR-04-a	Alt 1	1283	711	729	736	803	1165
	Alt 2	1283	711	658	661	612	694
	Alt 3	1283	711	628	605	294	537
	No Action	1283	711	728	736	803	1039
OR-04-b	Alt 1	1083	893	964	1076	1076	1080
	Alt 2	1083	893	960	1072	1072	1072
	Alt 3	1083	893	959	1071	721	1068
	No Action	1083	893	964	1076	1076	1076
OR-04-c	Alt 1	13378	7560	7575	7575	7701	12059
	Alt 2	13378	7560	7452	7450	7432	10999
	Alt 3	13378	7560	6755	6465	5458	6851
	No Action	13378	7560	7582	7580	7724	11177
OR-04-d	Alt 1	20059	10832	10945	11251	11340	17555
	Alt 2	20059	10832	7755	6723	4092	5535
	Alt 3	20059	10832	10834	11156	11069	10642
	No Action	20059	10832	10945	11283	11407	16553
OR-04-e	Alt 1	50508	26602	27244	27615	29639	46806
	Alt 2	50508	26602	26780	26336	27211	42963
	Alt 3	50508	26602	24887	21442	17695	30230
	No Action	50508	26602	27429	27968	29840	46945
OR-04-f	Alt 1	20099	12133	12220	13014	13512	17531
	Alt 2	20099	12133	9482	7901	3248	3423
	Alt 3	20099	12133	11148	9212	5219	13302
	No Action	20099	12133	12220	13040	13743	18431
OR-04-g	Alt 1	15352	7374	7280	7287	7405	12759
	Alt 2	15352	7374	7034	6437	3319	4064
	Alt 3	15352	7374	6294	4901	3355	8483
	No Action	15352	7374	7082	7146	7912	12618

Critical Habitat Unit	Alternative	Habitat-capable (ac)	Marbled murrelet nesting habitat (ac)				
			2006	2016	2026	2056	2106
OR-04-i	Alt 1	79203	34727	38319	41145	46096	71373
	Alt 2	79203	34727	33995	34037	32619	47235
	Alt 3	79203	34727	34184	32490	29996	51010
	No Action	79203	34727	38410	41538	49490	70351
OR-04-j	Alt 1	55887	25062	27390	29112	32083	51859
	Alt 2	55887	25062	23712	23768	21026	25494
	Alt 3	55887	25062	25354	24338	20163	33843
	No Action	55887	25062	27740	30180	33584	50827
OR-04-k	Alt 1	25526	13379	14524	15283	16322	23694
	Alt 2	25526	13379	14234	14956	15706	21771
	Alt 3	25526	13379	13701	13541	8513	14137
	No Action	25526	13379	14637	15656	16724	22211
OR-06-a	Alt 1	39	26	26	26	26	36
	Alt 2	39	26	7	7	7	7
	Alt 3	39	26	4	4	4	26
	No Action	39	26	26	26	26	36
OR-06-b	Alt 1	49888	26052	27344	28484	29942	43864
	Alt 2	49888	26052	27034	28113	27242	38638
	Alt 3	49888	26052	26873	26206	25836	22602
	No Action	49888	26052	27509	28719	30299	42247
OR-06-c	Alt 1	4608	3508	3406	3444	3543	4447
	Alt 2	4608	3508	1526	1238	1189	1543
	Alt 3	4608	3508	2932	2461	1896	3652
	No Action	4608	3508	3486	3523	3543	4389
OR-06-d	Alt 1	16177	8407	8445	8494	9627	15545
	Alt 2	16177	8407	6551	5041	3045	3569
	Alt 3	16177	8407	6347	4959	3961	8965
	No Action	16177	8407	8405	8611	9843	15324
OR-07-a	Alt 1	2364	1466	1227	1227	1752	2127
	Alt 2	2364	1466	998	749	719	750
	Alt 3	2364	1466	1534	1580	918	1289
	No Action	2364	1466	1218	1289	1801	2114
OR-07-b	Alt 1	2168	1073	1304	1304	2047	2047
	Alt 2	2168	1073	1300	1300	2166	2167
	Alt 3	2168	1073	1302	1302	2167	2167
	No Action	2168	1073	1428	1428	2171	2171

Critical Habitat Unit	Alternative	Habitat-capable (ac)	Marbled murrelet nesting habitat (ac)				
			2006	2016	2026	2056	2106
OR-07-d	Alt 1	1839	836	836	868	1194	1723
	Alt 2	1839	836	509	442	1021	1469
	Alt 3	1839	836	837	868	1086	1565
	No Action	1839	836	836	876	1231	1752
OR-07-f	Alt 1	15595	8577	9459	9706	11030	14908
	Alt 2	15595	8577	6635	5982	6803	7271
	Alt 3	15595	8577	8589	7816	7344	10621
	No Action	15595	8577	11472	11711	13467	15016
OR-07-g	Alt 1	2078	984	1085	1085	1097	1469
	Alt 2	2078	984	829	450	367	394
	Alt 3	2078	984	1034	999	1248	835
	No Action	2078	984	1085	1085	1085	1514

Special Status Animal Species

The following table shows the Bureau Special Status Animal Species in the planning area by their habitat group and location.

Table 255. Documented and suspected occurrence of Bureau special status animal species (as of March 14, 2005) within the planning area of the Western Oregon Plan Revision.

Scientific Name	Common Name	District						
		Status [1]	Coos Bay	Eugene	Klamath Falls	Medford	Roseburg	Salem
Amphibians and Reptiles								
*Rana pretiosa**	Oregon spotted frog	FC			D	D		
*Batrachoseps wrighti**	Oregon slender salamander	BS		D				D
Chrysemys picta	Painted turtle	BS		S				S
Clemmys marmorata marmorata	Northwestern pond turtle	BS	D	D	D	D	D	S
*Plethodon stormi**	Siskiyou mountains salamander	BS				D		
Rhyacotriton kezeri	Columbia torrent salamander	BS						D
Aneides flavipunctatus	Black salamander	BA				D		
Ascaphus montanus	Inland tailed frog	BA			S			
Batrachoseps attenuatus	California slender salamander	BA	D					
Dicamptodon copei	Cope's giant salamander	BA						D
Plethodon larselli	Larch mountain salamander	BA						S
*Rana boylii**	Foothill yellow-legged frog	BA	D	D		D	D	S
*Rhyacotriton cascadae**	Cascade torrent salamander	BA		D				D
Birds								
Pelecanus occidentalis californicus	California brown pelican	FE	D	S		S		
*Brachyramphus marmoratus maroratum**	Marbled murrelet	FT	D	D		S	D	D
Charadrius alexandrinus nivosus	Western snowy plover (coastal population)	FT	D					
*Haliaeetus leucocephalus**	Bald eagle	FT	D	D	D	D	D	D
*Strix occidentalis caurina**	Northern spotted owl	FT	D	D	D	D	D	D
Eremophila alpestris strigata	Streaked horned lark (oregon cr , wv, km)	FC	D	S		D		
*Accipiter gentilis**	Northern goshawk	BS	D	D	D	D	D	D
Anser albifrons elgasi	Tule goose	BS	S		S			
Athene cunicularia hypugaea	Burrowing owl (wv, km, hp, cb, bm)	BS	D			S		

Bartramia longicauda	Upland sandpiper	BS	D					
Branta canadensis leucopareia	Aleutian canada goose (wintering)	BS	D	S				
Branta canadensis occidentalis	Dusky canada goose	BS	S	D				
Buteo regalis	Ferruginous hawk	BS			D	D		
Centrocercus urophasianus	Greater sage-grouse	BS			S			
Chordeiles minor	Common nighthawk (wv)	BS	D	D				D
Coturnicops noveboracensis	Yellow rail	BS			D			
*Falco peregrinus anatum**	American peregrine falcon	BS	D	D	D	D	D	D
Falco peregrinus tundrius	Arctic peregrine falcon	BS	D	S		S		S
Glaucidium gnoma	Northern pygmy-owl (Blue Mtns)	BS	D					
Icteria virens	Yellow-breasted chat (wv)	BS	D	D				D
Melanerpes lewis	Lewis' woodpecker (wv, km, wc, ec, cb)	BS	D	D	D	D	D	D
*Otus flammeolus**	Flammulated owl (ec, bm, br, wc, km)	BS			D	D		
Picoides albolarvatus	White-headed woodpecker (km, wc, ec, bm)	BS			D	D		
Picoides arcticus	Black-backed woodpecker (km, wc, ec, bm)	BS				D		D
Picoides tridactylus	Three-toed woodpecker (wc, ec, bm)	BS				D		D
Podiceps grisegena	Red-necked grebe (breeding pops: wc, ec)	BS			D	D		
Pooecetes gramineus affinis	Oregon vesper sparrow (wv, km, cr)	BS	D	D			D	S
*Progne subis**	Purple martin (cr, wv, km, wc, ec)	BS	D	D		S	D	D
Sturnella neglecta	Western meadowlark (wv)	BS		D				
Agelaius tricolor	Tricolored blackbird (breeding pop: wv, km, ec, hp, cb)	BA			D	D		
Ammodramus savannarum	Grasshopper sparrow (wv)	BA		D				
Cerorhinca monocerata	Rhinoceros auklet	BA	S					S
Cygnus buccinator	Trumpeter swan	BA	S		D	D		
Dolichonyx oryzivorus	Bobolink	BA	D					
Elanus leucurus	White-tailed kite	BA	D	D		D	D	
Falco columbarius	Merlin (possible breeding pop: ec, cb, br)	BA			S			
Fratercula cirrhata	Tufted puffin	BA	S					D
Histrionicus histrionicus	Harlequin duck (breeding pops: wc, ec, bm)	BA		D			D	D
Melanerpes lewis	Lewis' woodpecker	BA	D	S	D	D	D	S
Oceanodroma furcata	Fork-tailed storm petrel (breeding population)	BA	S					
Pelecanus erythrorhynchos	American white pelican (breeding pops: ec, br)	BA			D			
Ptychoramphus aleuticus	Cassin's auklet	BA	S					

Invertebrates								
Icaricia icarioides fenderi	Fender's blue butterfly	FE		D				S
Branchinecta lynchi	Vernal pool fairy shrimp	FT				D		
Speyeria zerene hippolyta	Oregon silverspot butterfly	FT						S
Euphydryas editha taylori	Whulge checkerspot (butterfly)	FC		S				S
*Polites mardon**	Mardon skipper (butterfly)	FC	S	S		D		
Acetropis americana	American grass bug	BS		S				S
Algamorda newcombiana	Newcomb's littorine snail	BS	D					
Allomyia scotti	Scott's apatanian caddisfly	BS					S	
Anodonta wahlametensis	Willamette floater (mussel)	BS						S
Chloealtis aspasma	Siskiyou short-horned grasshopper	BS		S		D		S
Cryptomastix devia	Puget oregonian (snail)	BS						D
Cryptomastix populi	Hells canyon land snail	BS						
Deroceras hesperium	Evening fieldslug	BS		S	D	D		S
Driloleirus macelfreshi	Oregon giant earthworm	BS	S					S
Fluminicola sp. nov.	Fall creek pebblesnail	BS				D		
Fluminicola sp nov.	Keene creek pebblesnail	BS				D		
Fluminicola sp nov.	Toothed pebblesnail	BS				D		
*Fluminicola sp. nov. 1**	Klamath pebblesnail	BS			D	S		
Fluminicola sp. nov. 11	Nerite pebblesnail	BS			S	D		
Fluminicola sp. nov. 3	Diminutive pebblesnail	BS			D			
Gliabates oregonius	Salamander slug	BS	D	S				D
Helisoma newberryi newberryi	Great basin ramshorn (snail)	BS			D			
*Helminthoglypta hertleini**	Oregon shoulderband (snail)	BS	S			D	D	
*Hesperarion mariae**	Tillamook westernslug	BS	S [2]	D				D
Hochbergellus hirsutus	Sisters hesperian (snail)	BS	S					
Incisalia polia maritima	Hoary elfin (butterfly)	BS	S	S				S
Lanx klamathensis	Scale lanx (snail)	BS			D	S		
Lanx subrotunda	Rotund lanx (snail)	BS	S				D	
Mitoura johnsoni	Johnson's hairstreak (butterfly)	BS						S
*Monadenia chaceana**	Chase sideband (snail)	BS			S	D	D	
Monadenia fidelis beryllica	Green sideband (snail)	BS	S				D	
Monadenia fidelis celeuthia	Travelling sideband (snail)	BS				D		
Monadenia fidelis ssp. nov.	Modoc sideband (snail)	BS			D			
Pisidium ultramontanum	Montane peaclam	BS	S			S		
Plebejus saepiolus littoralis	Insular blue butterfly	BS	D					S
Pomatiopsis binneyi	Robust walker	BS	S					
Pomatiopsis californica	Pacific walker	BS	S					S
*Pristiloma articum crateris**	Crater lake tightcoil (snail)	BS		S	S	S	D	S
Pristiloma pilsbryi	Crowned tightcoil (snail)	BS						S
Prophysaon sp. nov.	Klamath tail-dropper	BS	S				S	

Prophysaon vanattae pardalis	Spotted tail-dropper	BS	D	S			S	D
Pterostichus rothi	Roth's blind ground beetle	BS		S				S
Rhyacophila haddocki	Haddock's rhyacophilan caddisfly	BS		S				D
Vespericola sierrana	Siskiyou hesperian	BS				D		
Vespericola sp. nov.	Bald hesperian	BS		D				
Vespericola sp. nov.	Oak springs hesperian	BS		D				
Mammals								
Balaenoptera musculus	Blue whale	FE	S					
Eschrichtius robustus	Gray whale	FE	S					
Megaptera novaeangliae	Humpback whale	FE	S					
Odocoileus virginianus leucurus	Columbian white-tailed deer	FE						S
Eumetopias jubatus	Steller sea lion	FT	S					
*Martes pennanti pacifica**	Fisher	FC	S	D	S	D		
Arborimus longicaudus silvicola	Oregon red tree vole (nw or coast)	BS						D
Corynorhinus townsendii	Townsend's big-eared bat	BS	D	D	D	D	D	D
Odocoileus virginianus leucurus	Columbian white-tailed deer (Douglas County only)	BS					D	
Antrozous pallidus	Pallid bat	BA	S	S	D	D	D	S
Antrozous pallidus pacificus	Pacific pallid bat	BA	S	S		D	D	
Brachylagus idahoensis	Pygmy rabbit	BA			S			
Euderma maculatum	Spotted bat	BA			S			
Myotis thysanodes	Fringed myotis	BA	D	S	D	D	D	S
Thomomys bottae detumidus	Pistol river pocket gopher	BA	S					
Thomomys mazama helleri	Gold beach pocket gopher	BA	S					

* Species known from more than 20 sites

[1] Status Codes: FE - Federally listed as endangered; FT - Federally listed as threatened; FC -- Candidate for federal listing; BS - Bureau Sensitive; BA - Bureau Assessment.

[2] Occurrence Codes: D - Documented to occur within the district; S - Suspected to occur in the district



Appendix H. Fish

This appendix provides background on the analysis and modeling for fisheries including special status fish species, status of threatened and endangered salmonids, and intrinsic potential and large wood delivery models.

In this appendix:

Special Status Fish Species in the Planning Area 1071

Status Summaries and Evolutionary Significant Units for Threatened or Endangered Salmonids 1073

Intrinsic Potential Model and Large Wood Delivery Model 1082

Special Status Fish Species in the Planning Area

Fish species designated as Federally-Threatened or Endangered under the Endangered Species Act within the Planning Area, and the present status of Critical habitat designation are displayed in Table 256.

Table 256. Federally Threatened or Endangered Fish Species and Critical Habitat Designation within the Planning Area.

Species	ESU	Species Status	Critical Habitat Status
Chinook Salmon	Lower Columbia River	Threatened	Critical Habitat Designated
	Upper Willamette River	Threatened	Critical Habitat Designated
Coho Salmon	Southern Oregon/ Northern California	Threatened	Critical Habitat Designated
	Lower Columbia River	Threatened	Critical Habitat Designated
	Oregon Coast	Not warranted	N/A
Chum Salmon	Lower Columbia River	Threatened	Critical Habitat Designated
Steelhead	Lower Columbia River	Threatened	Critical Habitat Designated
	Upper Willamette River	Threatened	Critical Habitat Designated
Shortnose Sucker	Klamath Basin, Oregon	Endangered	Critical Habitat Proposed
Lost River Sucker	Klamath Basin, Oregon	Endangered	Critical Habitat Proposed
Bull Trout	Columbia River & Klamath River	Threatened	Critical Habitat Not Designated on Federal lands
Oregon Chub	Willamette River Valley	Endangered	Critical Habitat not designated

Fish species designated by the Bureau of Land Management as Bureau Sensitive or Bureau Assessment species are displayed in Table 257. For a complete list of non-status fish species endemic to the Planning Area, refer to the Oregon Natural Heritage Program website at (http://oregonstate.edu/ornhic/areas.html).

Table 257. Bureau Sensitive and Bureau Assessment Fish Species Present in the Planning Area.

Species	Status*
Millicoma Dace	Bureau Sensitive
Jenny Creek Redband Trout	Bureau Sensitive
Jenny Creek Sucker	Bureau Sensitive
Umpqua Oregon Chub	Bureau Sensitive
Miller Lake Lamprey	Bureau Sensitive
Coastal Cutthroat Trout (Columbia River/Southwest Washington)	Bureau Sensitive
Oregon Coast Coho Salmon	Bureau Sensitive
Fall Chinook Salmon (Southern Oregon Coast/California Coast)	Bureau Sensitive
Chum Salmon (Pacific Coast)	Bureau Sensitive
Spring Chinook Salmon (Southern Oregon Coast/California Coast)	Bureau Assessment
Steelhead (Klamath Mountains Province, Winter Run)	Bureau Assessment
Steelhead (Klamath Mountains Province, Summer Run)	Bureau Assessment

* Information from BLM Special Status Species List 8/10/06.

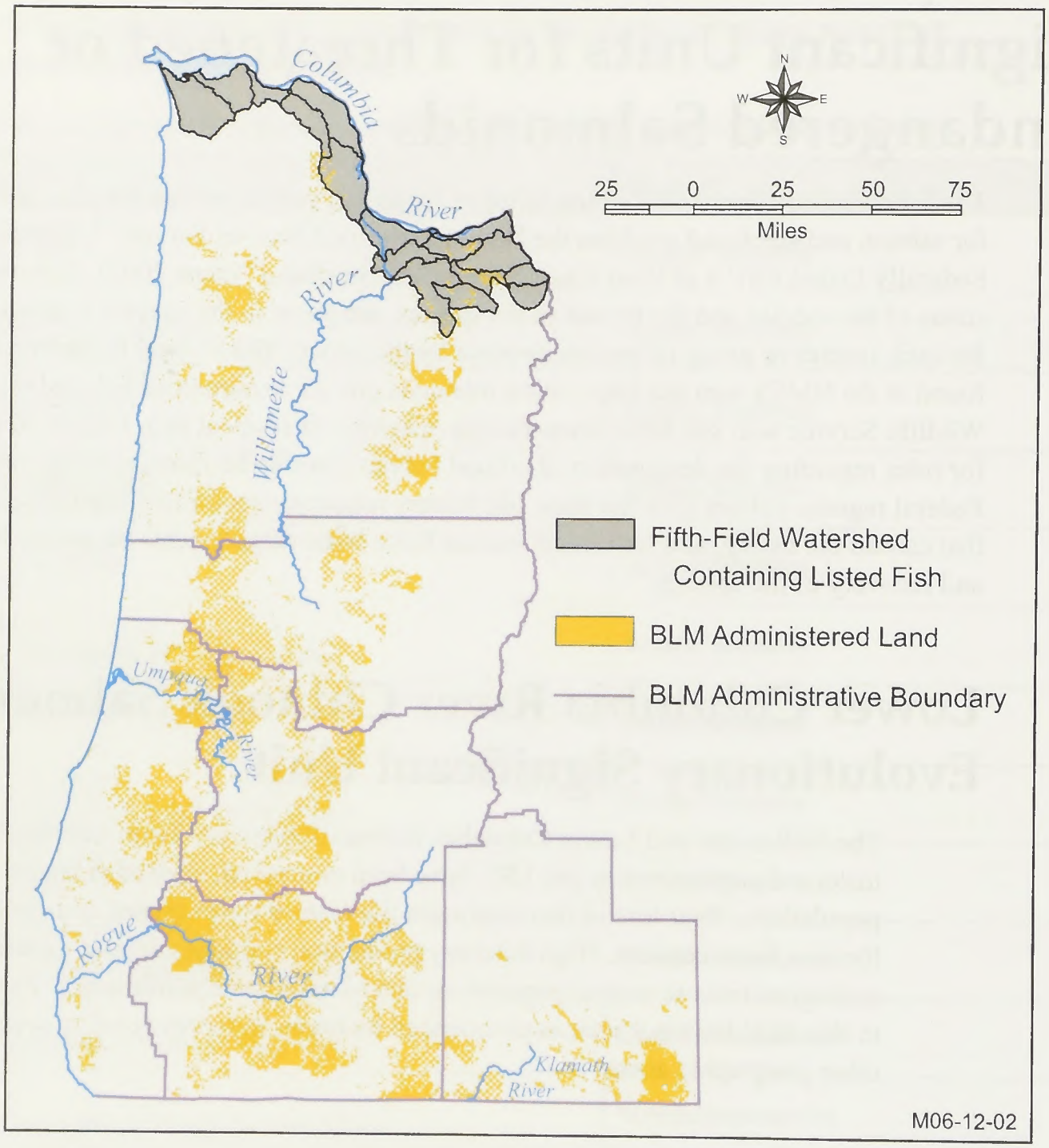
Status Summaries and Evolutionary Significant Units for Threatened or Endangered Salmonids

The following are summaries of the status of listed fish species within the plan area. Summaries for salmon and steelhead are from the National Marine Fisheries Service "Updated Status of Federally Listed ESU's of West Coast Salmon and Steelhead" (June 2005). The specific listing status of the species and the threats to the species, are given in the specific Federal Register notice for each species or group of species covered by the notice. The Federal Register notices can be found at the NMFS web site http://www.nwr.noaa.gov for anadromous fish and the U.S. Fish and Wildlife Service web site http://www.fws.gov/pacific/ for resident fish. Federal Register notices for rules regarding the designation of critical habitat can also be found at these web sites. The Federal register notices give the basic life history requirements for the listed species, the threats that caused the listing, and for critical habitat those basic requirements necessary for the survival and recovery of the species.

Lower Columbia River Chinook Salmon Evolutionary Significant Unit

The Willamette and Lower Columbia Technical Recovery Team estimated that 8 to10 historical populations in this ESU have been extirpated, most of them spring-run populations. Near loss of that important life history type remains an important Biological Review Team concern. High hatchery production continues to pose genetic and ecological risks to natural populations and to mask their performance. Most populations in this ESU have not seen as pronounced increases in recent years as occurred in many other geographic areas.

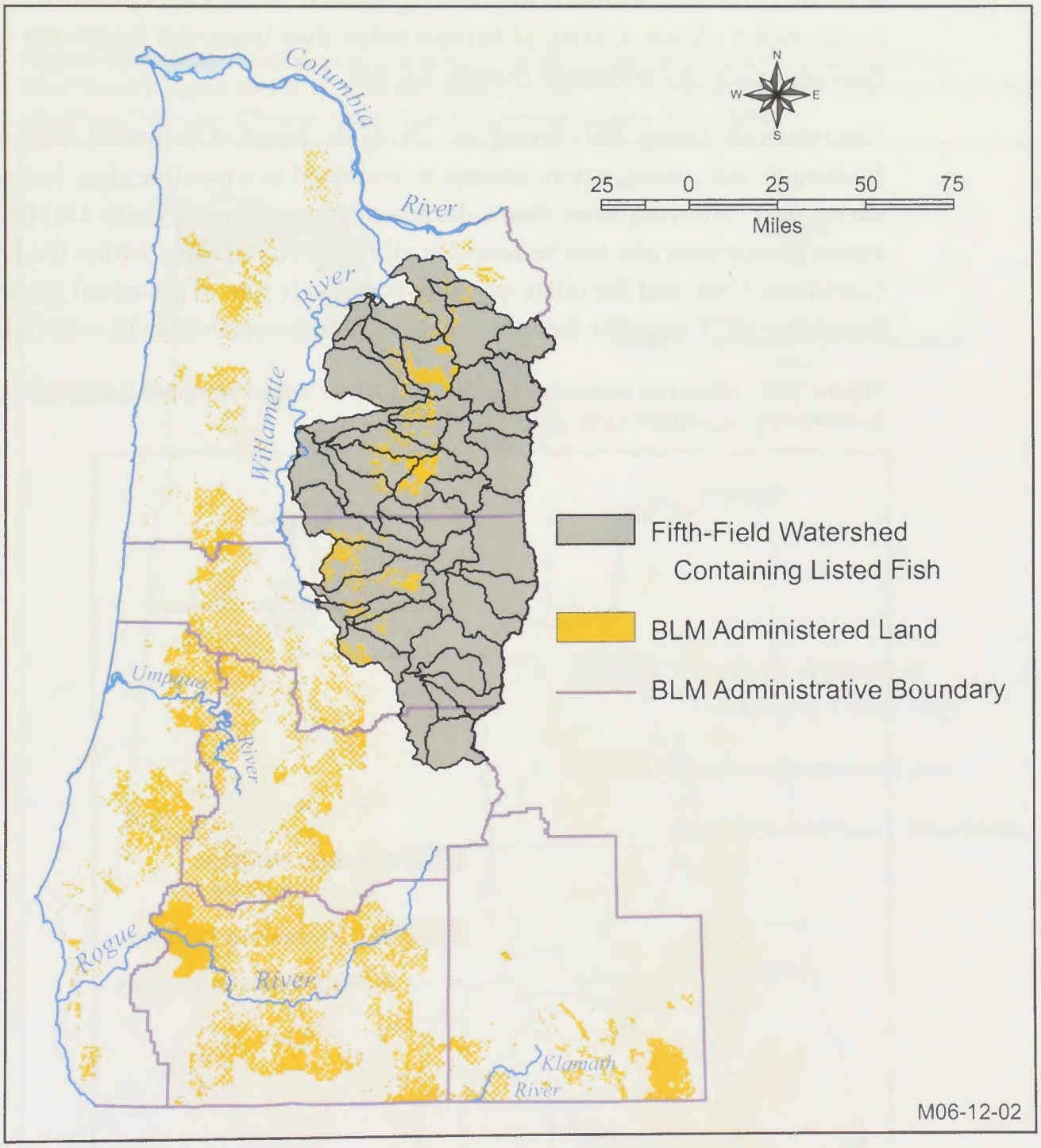
Figure 294. Historical independent Lower Columbia River Evolutionary Significant Unit early and late-fall-run Chinook salmon populations. Source: Myers et al. (2002).



Upper Willamette River Chinook Salmon Evolutionary Significant Unit

Updated status reviews and technical reports preliminary analysis indicate that most natural-origin spring-run Chinook populations are likely extirpated, or nearly so.

Figure 295. Historical populations of spring-run Chinook salmon in the Upper Willamette River Evolutionary Significant Unit. Source: Myers et al. (2002).

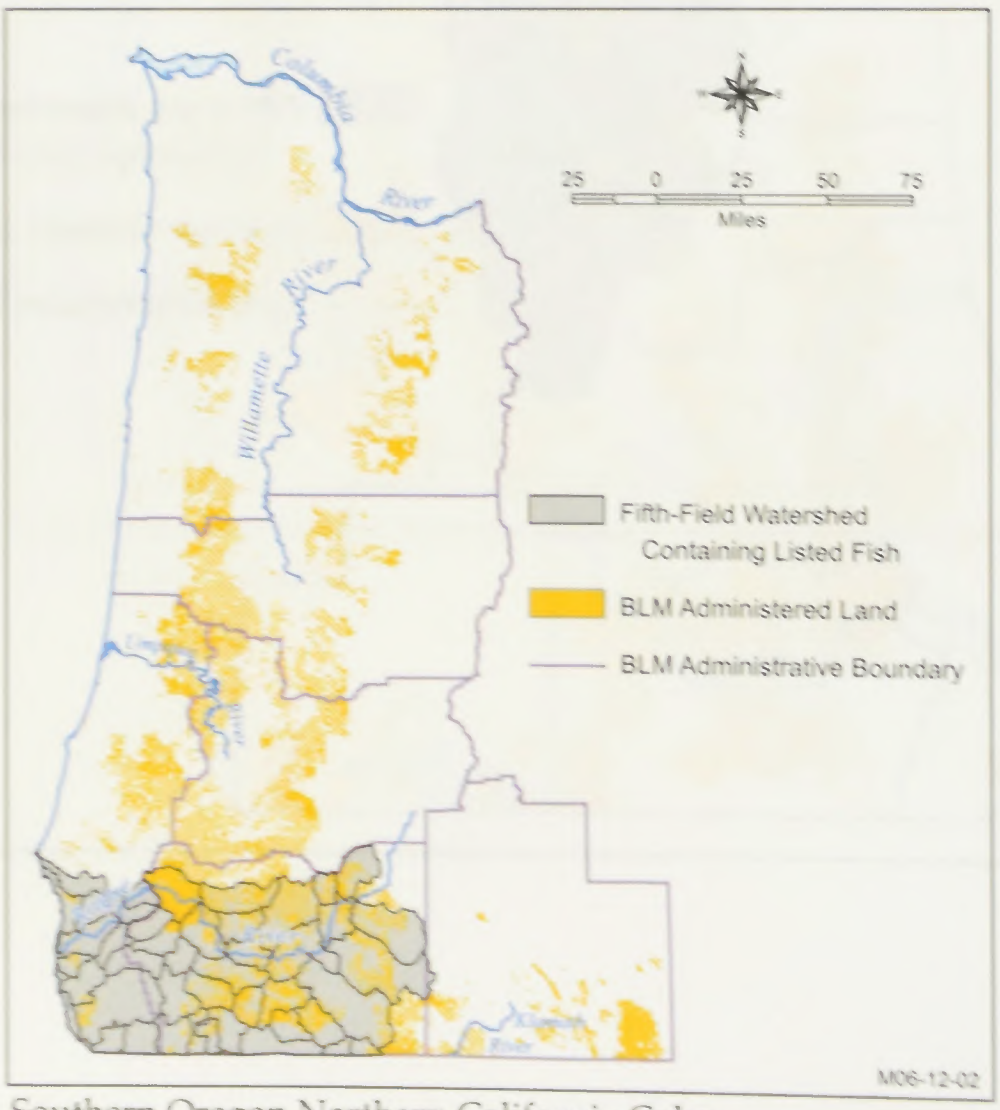


Southern Oregon/Northern California Coast Coho Salmon Evolutionary Significant Unit

Southern Oregon/Northern California Coast coho salmon Evolutionary Significant Unit exhibit low population abundance relative to historical numbers and long-term downward trends in abundance. A reliable time series of adult abundance is available only for the Rogue River. These data indicate that long-term (22-year) and short-term (10-year) trends in mean spawner abundance are trending upward in the Rogue, however, the positive trends reflect effects of reduced harvest rather than improved freshwater conditions, because trends in pre-harvest recruits are flat.

The relatively strong 2001 broodyear, likely the result of favorable conditions in both freshwater and marine environments, was viewed as a positive sign, but was a single strong year following more than a decade of generally poor years. On the positive side, extant populations can still be found in all major river basins within the Evolutionary Significant Unit, and the relatively high occupancy rate of historical streams observed in broodyear 2001 suggests that much habitat remains accessible to coho salmon.

Figure 296. Historical populations of the Southern Oregon/Northern California Coast Coho Evolutionary Significant Unit

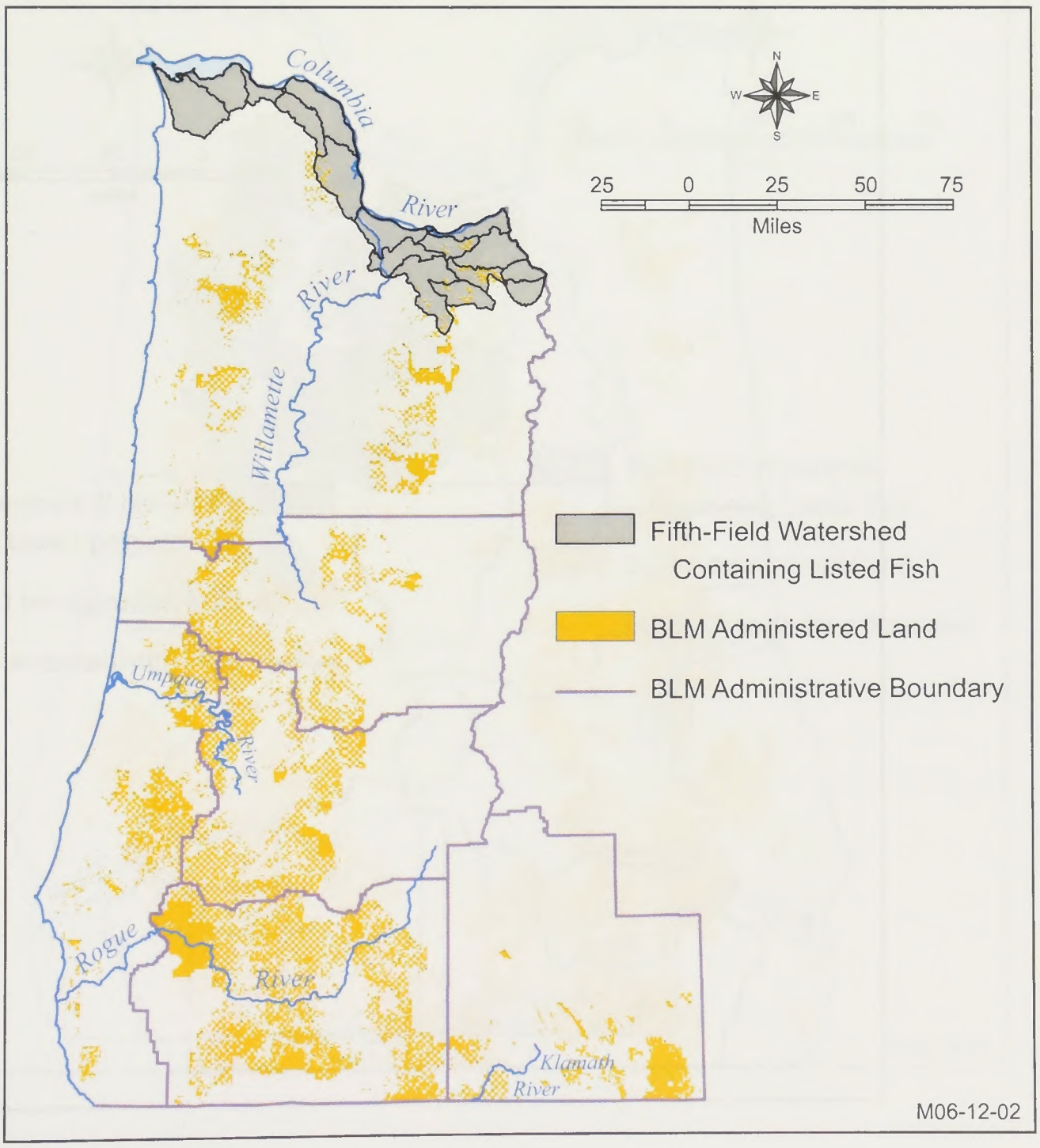


Southern Oregon Northern California Coho

Lower Columbia River Coho Salmon Evolutionary Significant Unit

In the only two populations with significant natural production (Sandy and Clackamas rivers), short- and long-term trends are negative, and productivity is down sharply from recent (1980s) levels. On the positive side, adult returns in 2000 and 2001 were up noticeably in some areas, and evidence for limited natural production has been found in some areas outside the Sandy and Clackamas rivers.

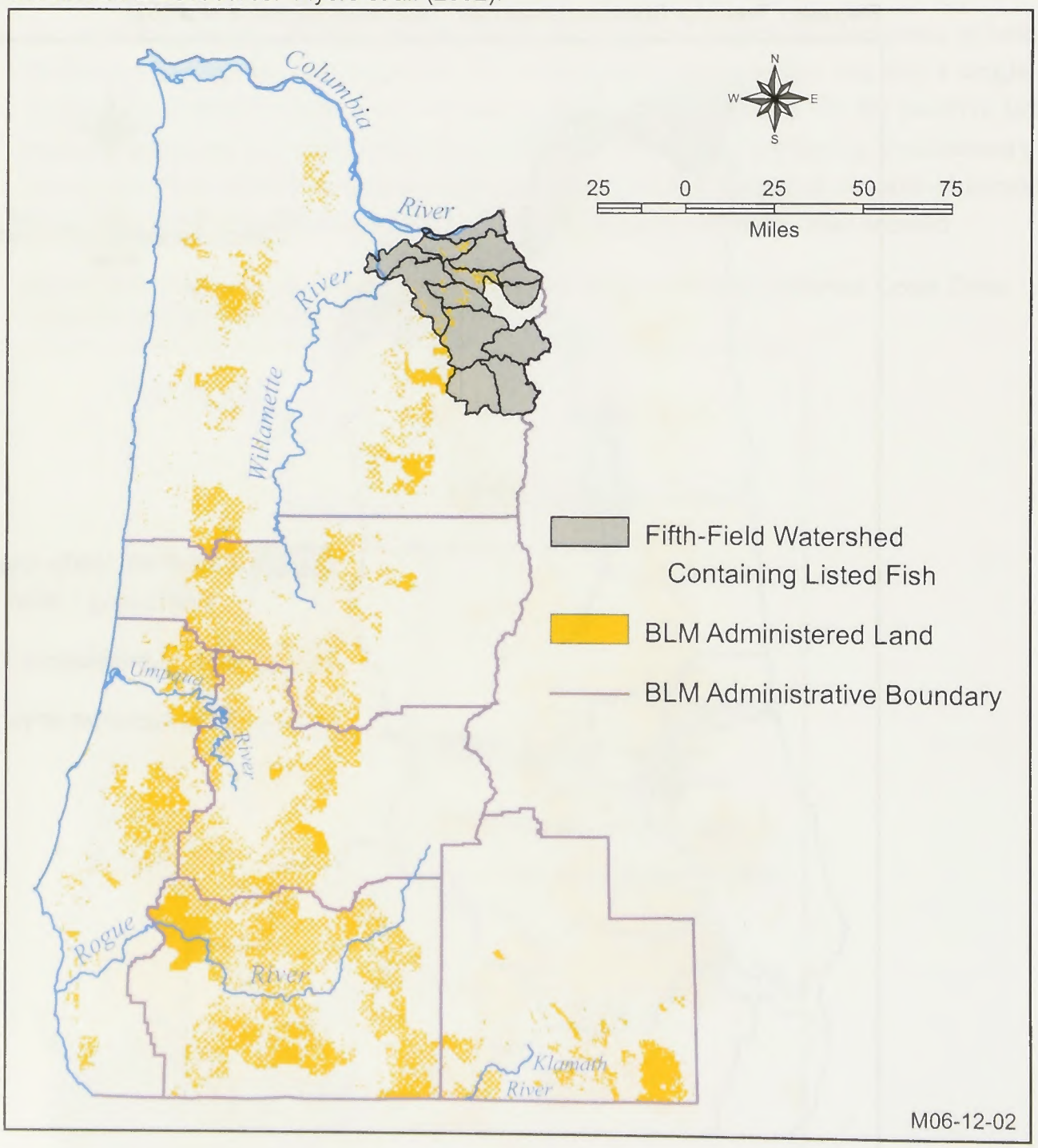
Figure 297. Tentative historical populations of the Lower Columbia River coho salmon Evolutionary Significant Unit. Source: based on work by Willamette/Lower Columbia Technical Recovery Team for Chinook salmon and steelhead (Myers et al. 2002).



Lower Columbia River Steelhead Evolutionary Significant Unit

Abundance of most populations is relatively low, and those populations for which there is adequate modeling data are estimated to have a relatively high extinction probability. Some populations, particularly summer run, have shown higher returns in the last 2 to 3 years. The Willamette and Lower Columbia Technical Review Team (Myers et al. 2002) has estimated that at least four historical populations are now extinct.

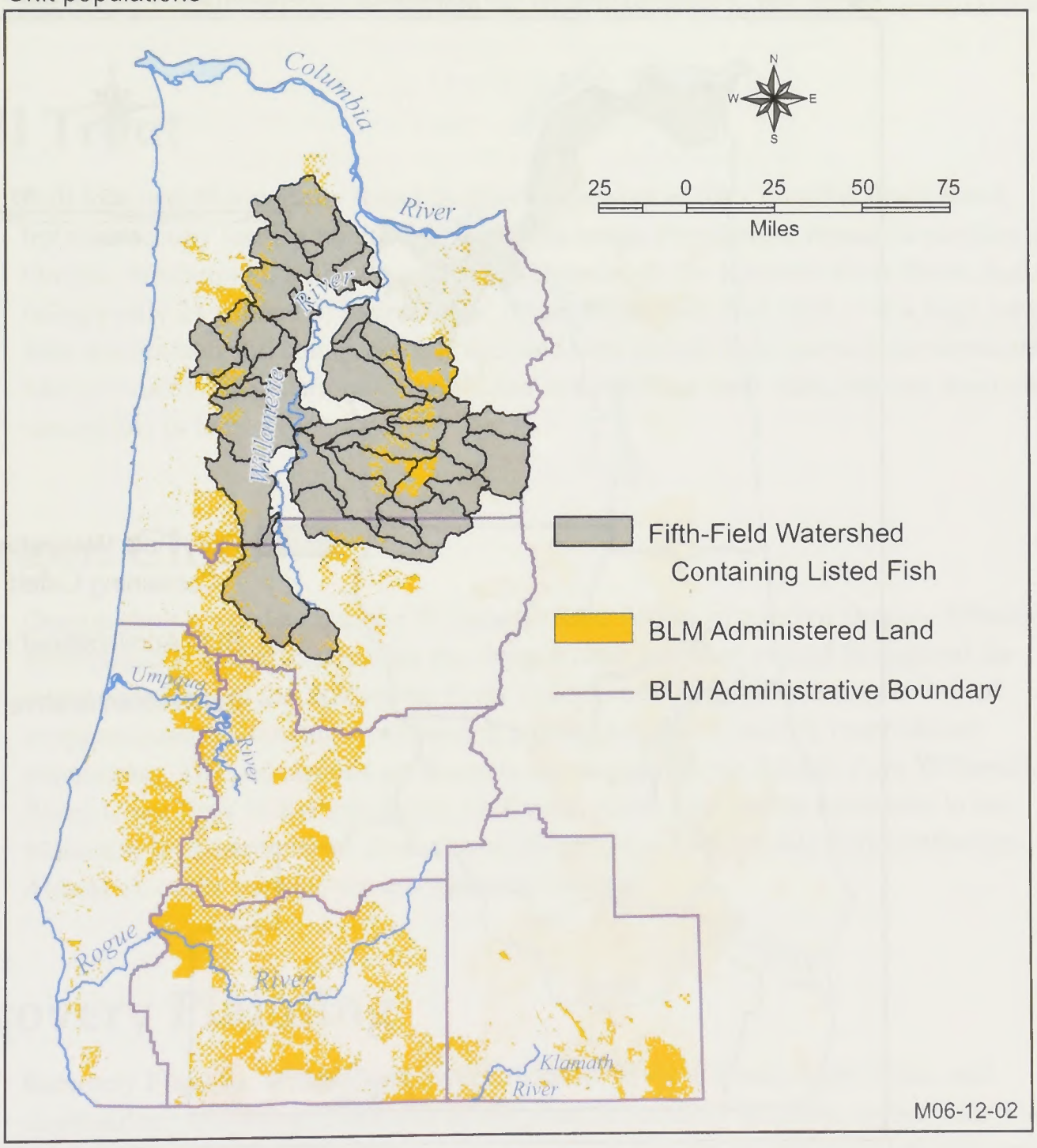
Figure 298. Historical populations of winter-run steelhead in the Lower Columbia River steelhead ESU.Source: Myers et al. (2002).



Upper Willamette River Steelhead Evolutionary Significant Unit

After a decade in which overall abundance (Willamette Falls count) hovered around the lowest levels on record, adult returns for 2001 and 2002 were up significantly, on par with levels seen in the 1980s. Still, the total abundance is small for an entire ESU, resulting in a number of populations that are each at relatively low abundance.

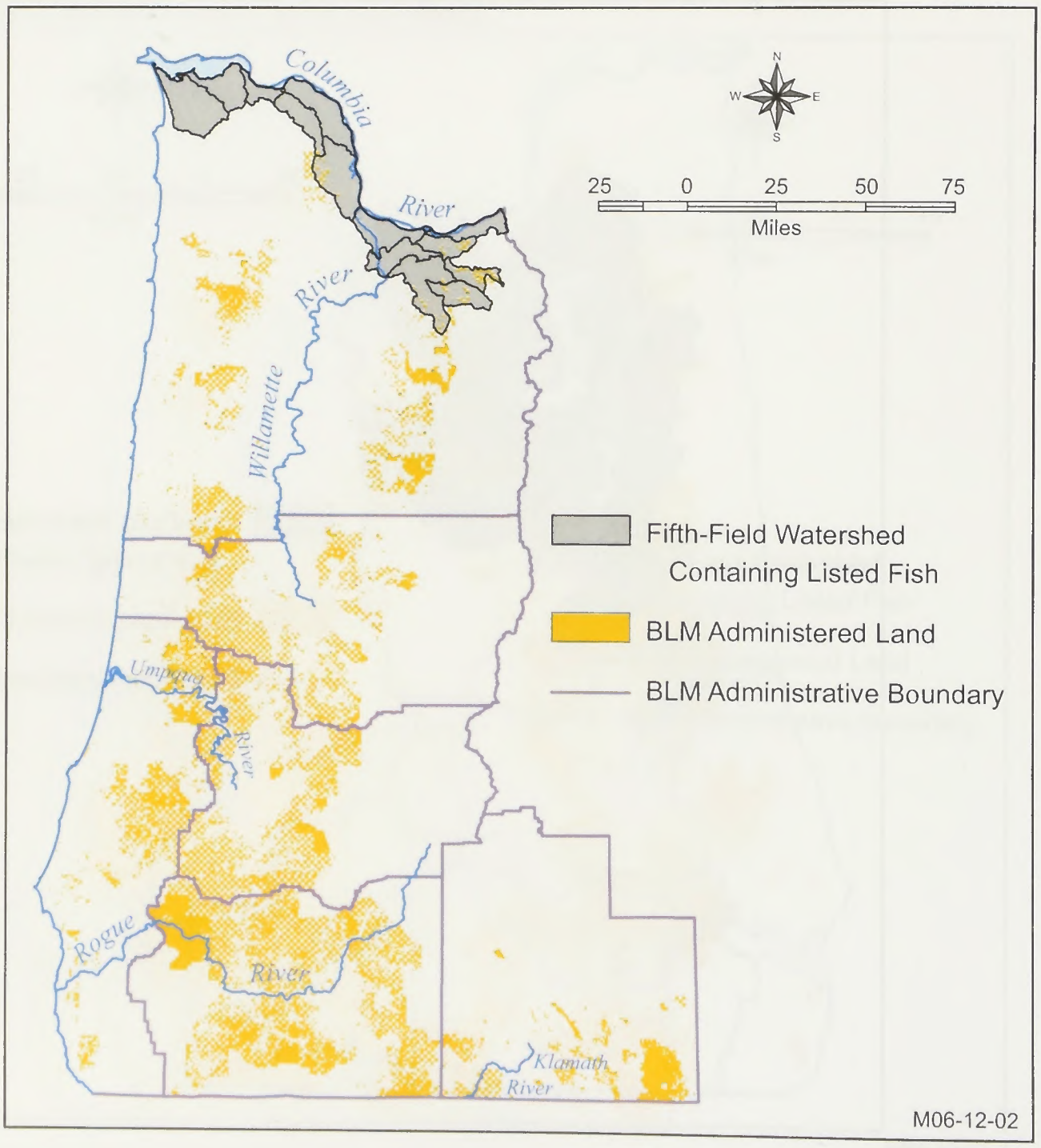
Figure 299. Map of historical Upper Willamette River steelhead Evolutionary Significant Unit populations



Columbia River Chum Salmon Evolutionary Significant Unit

Chum salmon spawn on the Oregon side of the lower Columbia Gorge in the Multnomah area, but appear to be essentially absent from other populations in the Oregon portion of the Columbia River chum salmon Evolutionary Significant Unit. With the exception of the lower Columbia Gorge population, Columbia River chum salmon are considered extirpated, or nearly so, in Oregon.

Figure 300. Historical chum salmon populations in the Columbia River chum salmon ESU.



Shortnose and Lost River Suckers

The Lost River and shortnose sucker are endemic to the Upper Klamath Basin of California and Oregon. Declining population trends for both species were noted as early as the mid-1960s, but the severity of the population declines was not evident until the early 1980s. In 1988, both Lost River and shortnose suckers were listed as endangered by the U.S. Fish and Wildlife Service.

The adult sucker monitoring program (USGS) has provided valuable information on the current status of sucker populations in the Upper Klamath Basin. Monitoring indicates there has been no significant recruitment into the adult population in the last few years (USGS).

Bull Trout

Bull trout were historically found in about 60 percent of the Columbia River Basin, but now occupy less than half of their historic range. Populations remain in portions of Oregon, Washington, Idaho, Montana and Nevada. In the Klamath River Basin, bull trout occupy only 21 percent of their historic range. While bull trout exist over a large area, their distribution and abundance has declined with several local extinctions documented. Many remaining populations are small and isolated from each other, making them more susceptible to local extinctions.

Oregon Chub

Oregon chub are endemic to the Willamette River Valley of western Oregon. Although information is scarce, historically the Oregon chub probably existed throughout the lower elevations of the Willamette River valley. The current distribution is limited to approximately 20 naturally occurring populations and 4 recently reintroduced populations. The populations are found in the Santiam River, Middle Fork Willamette River, Coast Fork Willamette River, McKenzie River, and several tributaries to the Mainstem Willamette River downstream of the Coast Fork/Middle Fork confluence. Almost all of the populations are small and isolated.

Recovery Planning

Recovery Plans for Willamette/Lower Columbia River chinook, coho, chum, and steelhead are underway. The status of the plans is currently available on the NMFS web site. Recovery Plans for Lost River and Shortnose suckers are available USFWS web site. The updated status of the various populations, a discussion of the existing limiting factors and threats to the populations will be developed in the various plans.

Intrinsic Potential Model and Large Wood Delivery Model

Intrinsic Potential Model

Intrinsic potential is a scientific, topographical approach used to determine the potential of a stream to provide high-quality habitat for salmonids. Comprehensive information on the location of stream reaches with the greatest potential to provide high-quality habitat for salmonids was generally missing for the planning area. The intrinsic potential of stream channels to provide high-quality rearing habitat was modeled for juvenile coho salmon (*Oncorhynchus kisutch*), juvenile steelhead (*O. mykiss*), and juvenile chinook salmon (*O. tshawytscha*). The initial research was conducted in the Coastal Landscape Analysis and Modeling Study (CLAMS) and was expanded for coho, steelhead and chinook on all ownerships within the planning area.

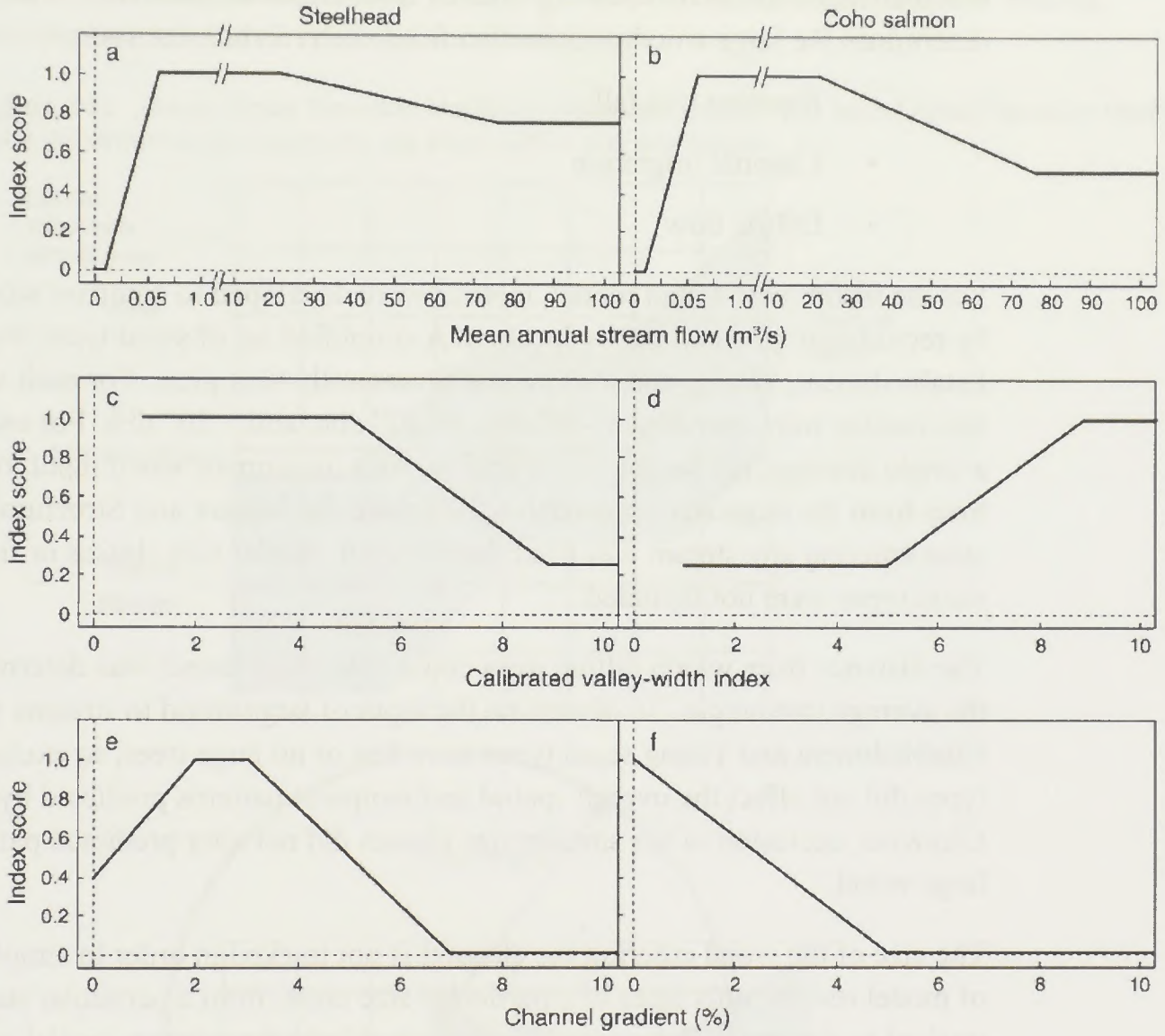
Spatial models were developed that estimate the potential of streams to provide high-quality rearing habitat for coho, steelhead and chinook. The calculated metric, termed intrinsic potential, reflects species-specific associations between fish use and persistent stream attributes; stream flow, valley constraint, and stream gradient.

The intrinsic potential for each stream reach was modeled independently for juvenile steelhead, coho, and chinook salmon from stream attributes of mean annual stream flow, valley constraint, and channel gradient. These attributes were produced in conjunction with the digital stream network from 10-m digital elevation models (DIGITAL ELEVATION MODELs) (Miller 2003). The stream network output was in an ArcView shape file format and then imported into ArcInfo (version 8.3; ESRI, Redlands, California, USA) for all subsequent processing. Stream attribute values were translated into index scores for each species (Figure 301. *Relationship between values of the three stream attributes (mean annual stream flow, calibrated valley-width index, and channel gradient) and the index scores that were used to calculate intrinsic potential for steelhead, coho, and chinook salmon*).

The index scores were based on empirical evidence from published studies regarding the relationship between a stream attribute and juvenile fish use. Following the most commonly applied approaches for modeling habitat suitability (Morrison et al. 1998 and Vadas and Orth 2001 in Burnett et al *in press*), intrinsic potential for each stream reach was calculated by multiplying the un-weighted species-specific index scores together and then taking the geometric mean of the product. This approach reflects the assumption that the three stream attributes are of approximately equal importance and only partially compensatory, and that the smallest index score has the greatest influence on the intrinsic potential. The index scores and intrinsic potential can range from zero to one; larger values indicating a greater potential for providing high-quality rearing habitat. Stream reaches were classified with a high species-specific intrinsic potential when the calculated

value was 0.75. Intrinsic potential is reported for a species only below naturally occurring barriers to migrating adults. (Burnett et al, *in press*)

Figure 301. Examples of relationship between values of the three stream attributes and the index scores used to calculate intrinsic potential.



Large Wood Delivery Model

The large wood delivery model is a spatially explicit, Geographic Information System-based wood recruitment model developed for this analysis to determine the potential large wood contribution to fish bearing streams from BLM-administered lands. The model determines the large wood contribution from each recruitment source:

- Riparian tree fall
- Channel migration
- Debris flow

For the wood recruitment model, metrics were developed to compare wood input rates by recruitment process and by location. A simplified set of stand types were used: Stand Establishment, Young, and Mature and Structurally Complex. For each stand type, three size classes were specified: 0-10"dbh, 10-20" dbh, and > 20" dbh. For each size class, a single average tree height was specified. As a measure of wood input, the number of trees from the large size class (dbh > 20") from the Mature and Structurally Complex size class entering any stream was used. Inputs from smaller size classes or from the other two stand types were not included.

The distance from which falling trees could enter the channel was determined using the average tree height. To determine the input of large wood to streams the Stand Establishment and Young stand types have few or no large trees, so excluding these stand types did not affect the overall spatial and temporal patterns predicted by the models. Likewise, exclusion of the smaller size classes did not alter predicted patterns of input of large wood.

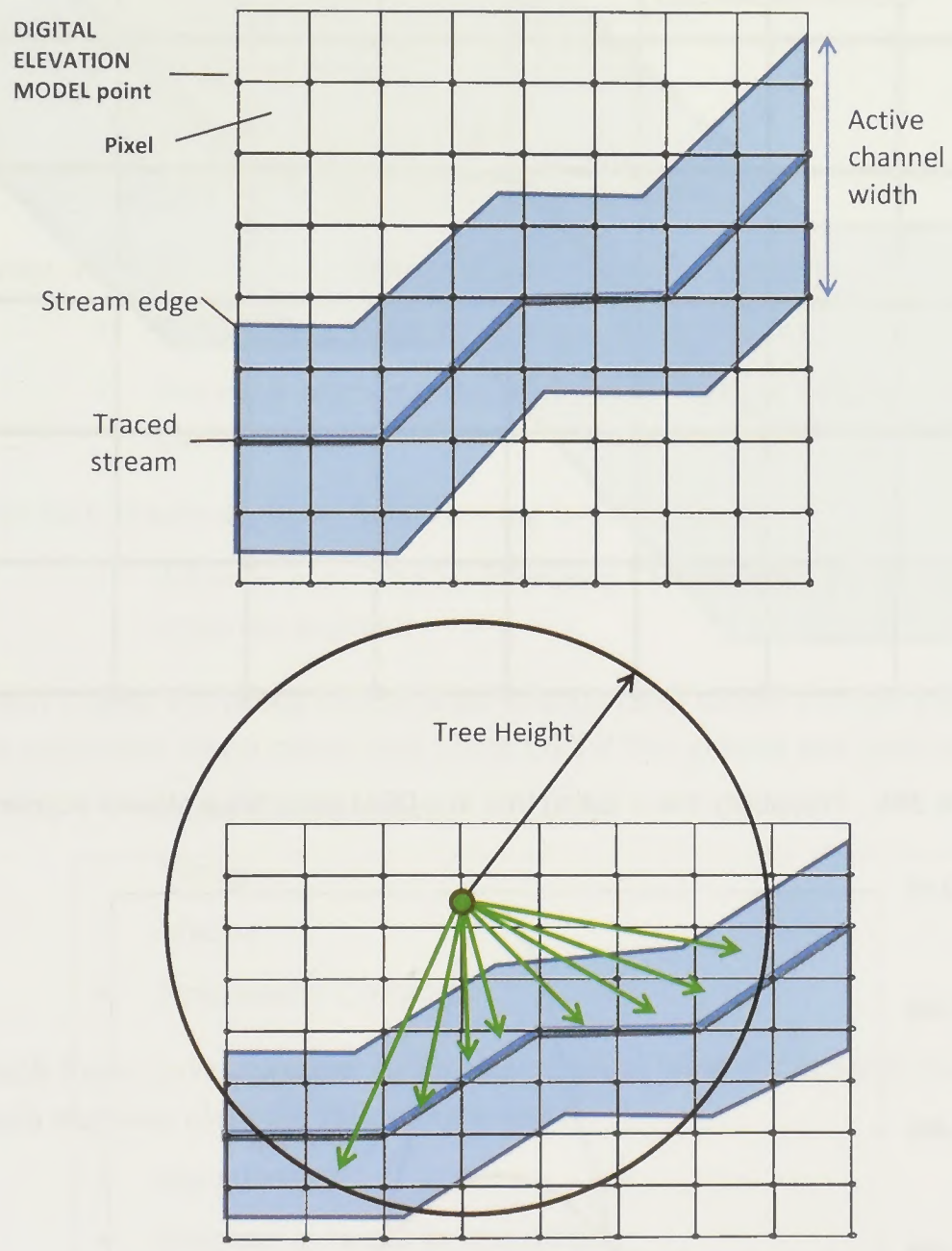
The size of the wood entering the channel is not tracked in order to simplify interpretation of model results; only trees of a particular size class, from a particular stand type, are tracked to channels. These simplifications highlight the primary spatial and temporal patterns predicted by the stand growth and wood recruitment models.

The model estimates average annual wood inputs, with no indication of temporal variability in input rates. This enables the identification of potential source areas for each recruitment processes, channel reaches potentially receiving wood from each process, and for examining spatial differences in average recruitment rates. However, the spatial pattern found for actual in-channel wood loads are very different than the pattern found for average recruitment rate: debris flow inputs, for example, occur only rarely. Hence, for any reach, the relative importance of debris flow inputs can vary dramatically over time depending on how long it has been since the last debris flow occurred. The stochastic nature of wood recruitment processes causes wood inputs to be episodic, punctuated in time a space. Patterns indicated by the wood recruitment model show where certain processes are active and how long-term average rates differ from location to location, but cannot predict how actual rates differ from year to year.

Methods

The stream channel network was traced using 10-meter Digital Elevation Models and the Western Oregon Plan Revision Geographic Information System stream fish distribution layer and Ground Transportation Road Network was used to determine fish bearing stream channels and all road and stream crossings.

Figure 302. Using Digital Elevation Models to delineate stream. For each Digital Elevation Model point, all stream-edge segments are found within one tree height.



For each stream-edge segment, the probability that a tree at the Digital Elevation Model point hits the segment when it falls was determined. Input information included the following and was repeated for every Digital Elevation Model point:

- Fall direction (closest edge segment)
- Angle subtended
- Distance to stream edge
- Slope at Digital Elevation Model point

Figure 303. Determining tree fall using DEMs.

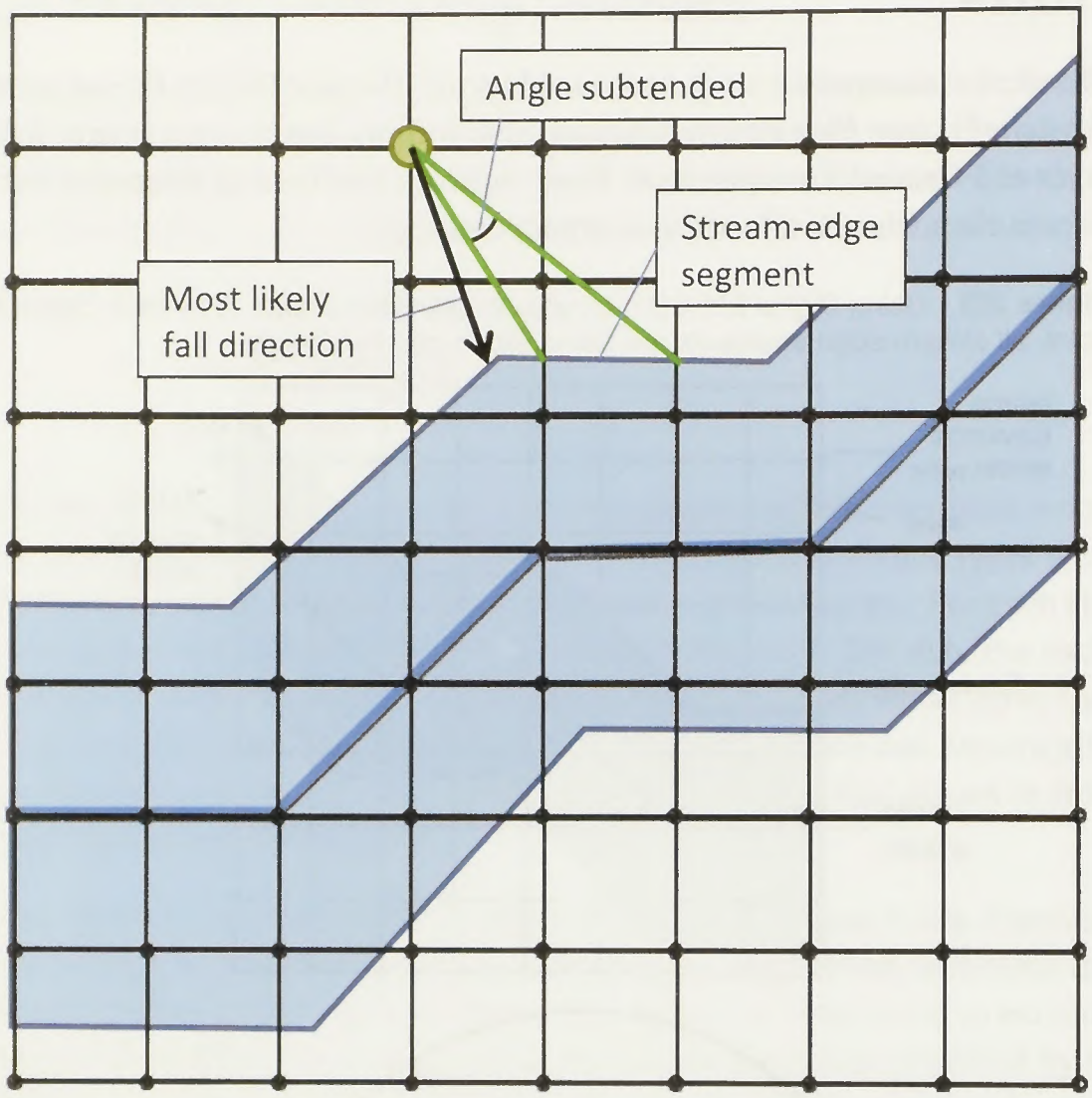
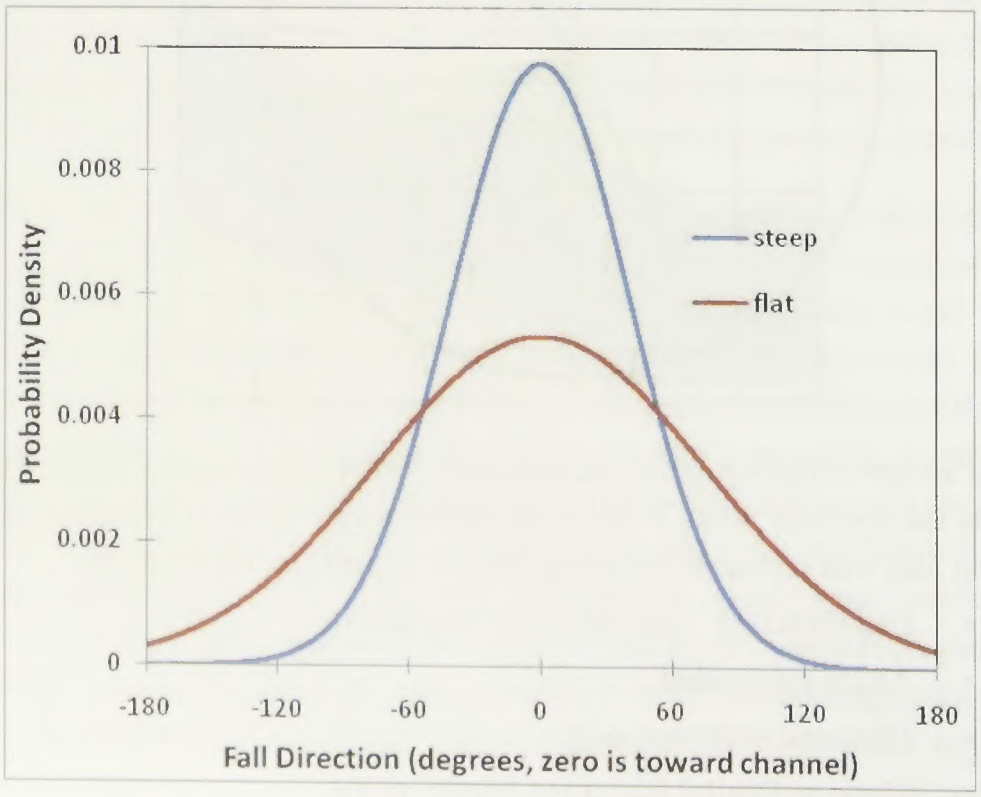


Figure 304. Probability that a falling tree at a DEM point hits a stream segment.



From these inputs, the following is determined for every Digital Elevation Model point:

- A list of every stream segment potentially hit by a falling tree from that point
- For each segment, the probability that the falling tree will cross the channel edge

For each stream-edge segment, the probability that a tree at the Digital Elevation Model point hits the segment when it falls was determined. Input information included the following and was repeated for every Digital Elevation Model point:

- Fall direction (closest edge segment)
- Angle subtended
- Distance to stream edge
- Slope at Digital Elevation Model point

From these inputs, the following is determined for every Digital Elevation Model point:

- A list of every stream segment potentially hit by a falling tree from that point
- For each segment, the probability that the falling tree will cross the channel edge

For each stream segment the following is determined:

- A list of every Digital Elevation Model point from which a falling tree might cross the segment

Each Digital Elevation Model point is associated with a 100-m2 pixel, and each pixel has an associated forest cover type (from OPTIONS growth and yield model):

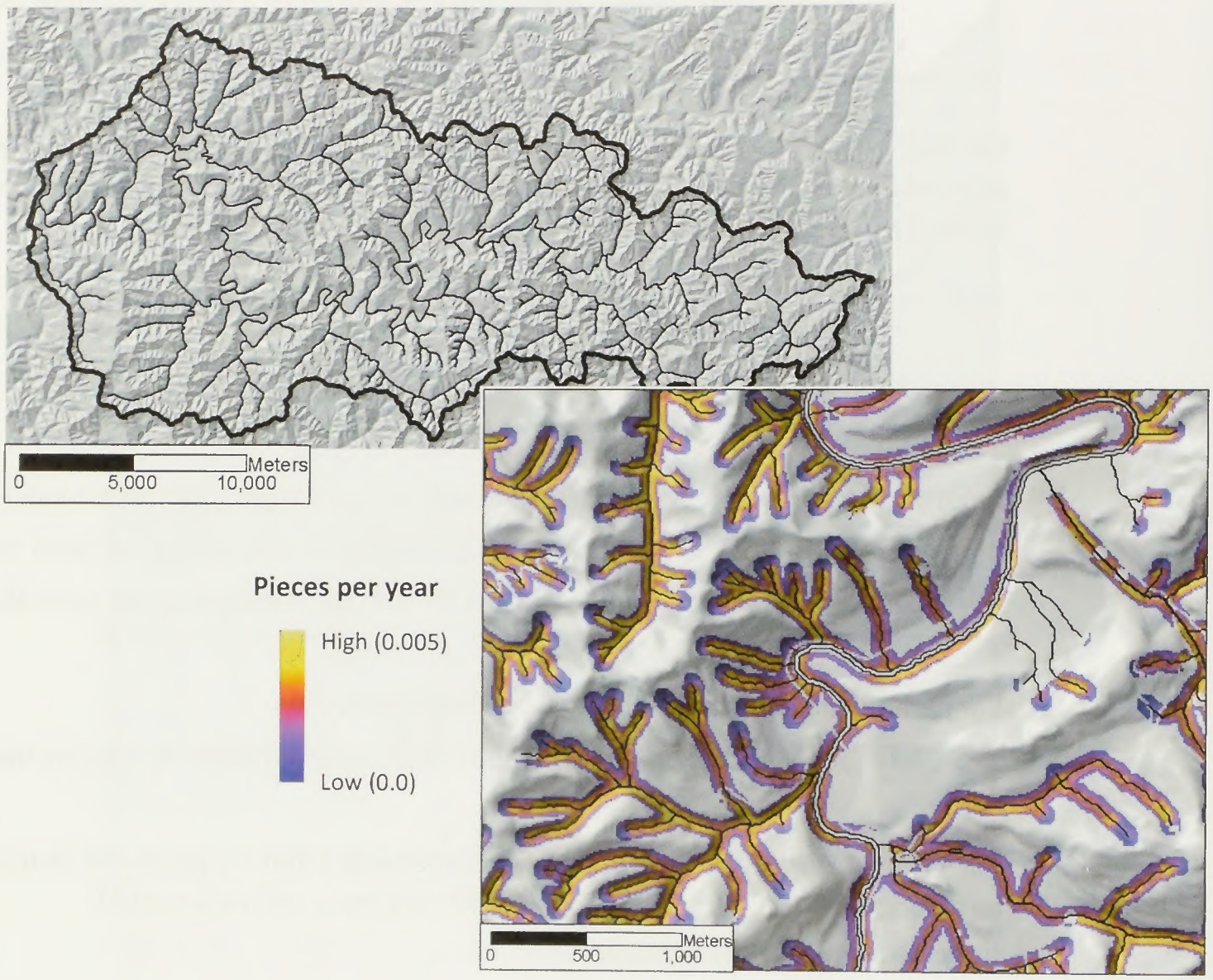
- Stand Establishment
- Young
- Mature
- Structurally Complex

Each forest cover type has an associated stand table divided into tree-size classes. For each tree-size class the following is used:

- stem density,
- diameter at breast height range
- average tree height
- mortality rate

With this information, for each corner of the pixel, the probability that a tree falls and that it hits a stream-edge segment is calculated. This probability is integrated over the area of the pixel to calculate the annual probability that a tree within the pixel falls and hits a stream-edge segment and is repeated for every segment potentially hit by a falling tree from within the pixel.

Figure 305. Tree fall from riparian areas dependent on: forest cover, hillslope gradient, distance to stream channel, and channel planform geometry.



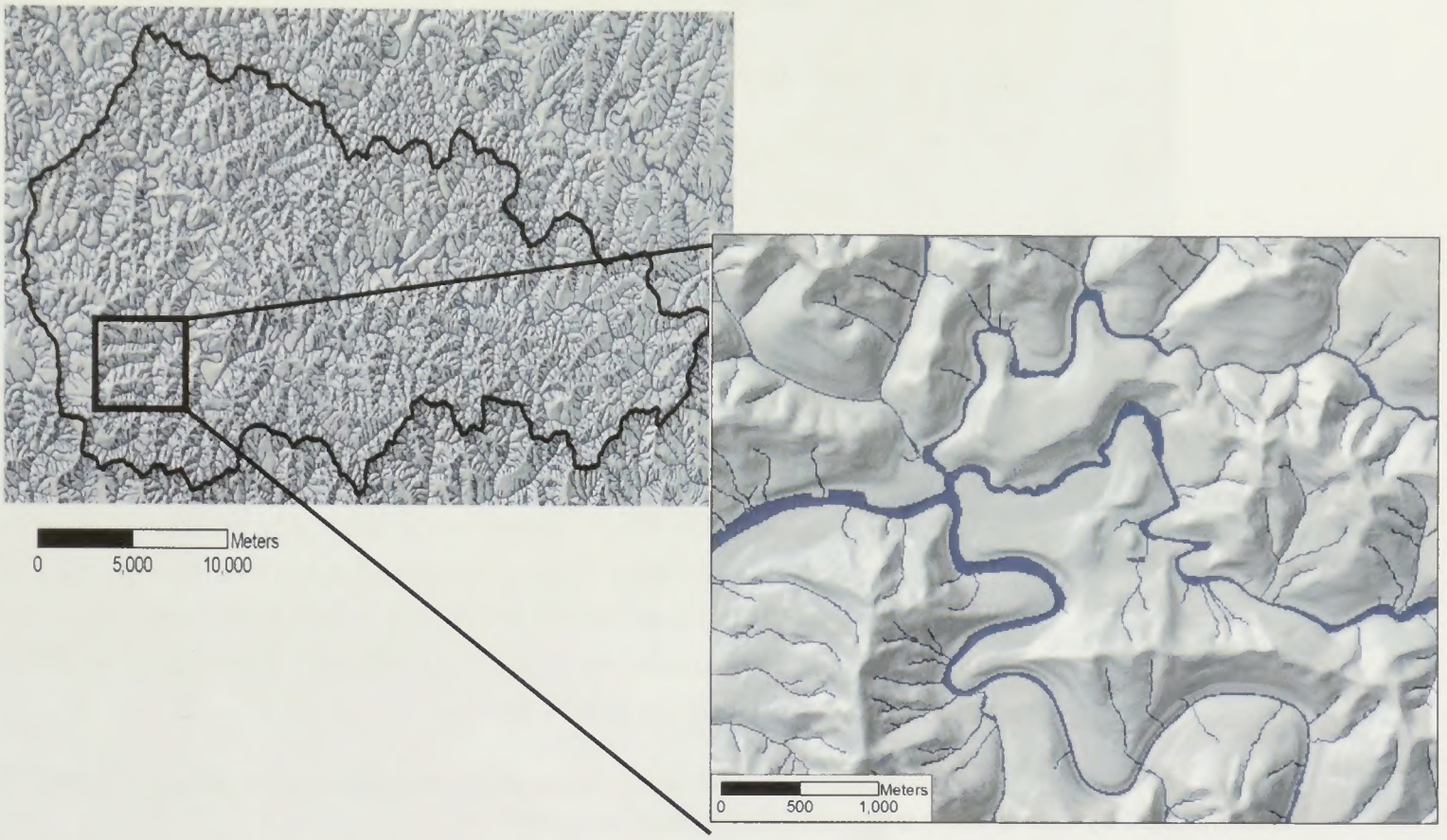
Channel Migration

To determine the large wood input from a channel migration zone the following factors were determined:

- Valley floor extent
- Valley floor composition and vegetation

To determine the channel migration zone, potential floodplain areas were delineated and a constant probability was applied of floodplain occupation (e.g. channel migration across the entire floodplain every 100 years). Wood recruitment was determined from stand tables with trees available for recruitment from each valley-floor pixel and assigning each valley-floor pixel a specified annual probability of being exhumed by the migrating channel (e.g., 0.01).

Figure 306. Identification of valley-floor pixels: within a specified elevation of the channel; within a specified slope relative to the channel slope; all pixels flagged meeting these criteria with the identification of the reach to which they drain.



Debris Flow

The model uses topographic characteristics from 10-meter Digital Elevation Models to identify all debris-flow initiation points across the landscape (Miller and Burnett, 2007) and identify the travel path from each source pixel to a fish bearing stream channel (Burnett and Miller, 2007; Miller and Burnett, in review). The Ground Transportation Road Network Geographic Information System layer was used with the travel path to determine road stream crossings and wood routing barriers. Each conditional probability that each Digital Elevation Model pixel was traversed by a debris flow was determined. All relative probabilities were multiplies to give a specified mean recurrence interval for all 3rd and higher-order channels (350 years).

For each Digital Elevation Model pixel, a mean annual probability of being traversed by a debris flow is determined. Starting from each debris-flow source pixel, the potential wood is accumulated pixel by pixel along each debris-flow source track

The proportion of wood taken from each pixel is determined by:

- Mean debris flow track width (from Oregon Department of Forestry data)
- The probability of no debris-flow deposition in the pixel

The proportion of accumulated wood deposited in each pixel is determined by the relative downslope decrease in debris-flow traversal probability (e.g., if traversal probability decreases by 20%, 20% of the accumulated wood is deposited)

Sources for debris flow wood:

- Standing trees (from stand tables)
- Down wood (calculated as per riparian)
- Wood deposited by previous debris flows

The amount of deposited wood that gets picked up by the next debris flow is determined by the probability that the wood is still in the channel when the next debris flow comes along (1 – (1-PDF)R); where PDF is annual probability of debris flow traversal and R is (1/PDF), the recurrence interval. This is equal to ~0.63 for all values of PDF. The assumption is that only buried wood survives (surface wood decays) and that 30% of the wood is buried. That gives ~20% of previously deposited wood available for future debris flow scour. This amount was multiplied by the probability of scour to estimate the amount of previously deposited wood picked up by debris flows.

Figure 307. Debris flow source areas for wood are widely distributed, but most of the wood accumulated by debris flows is scoured from low-order channels.

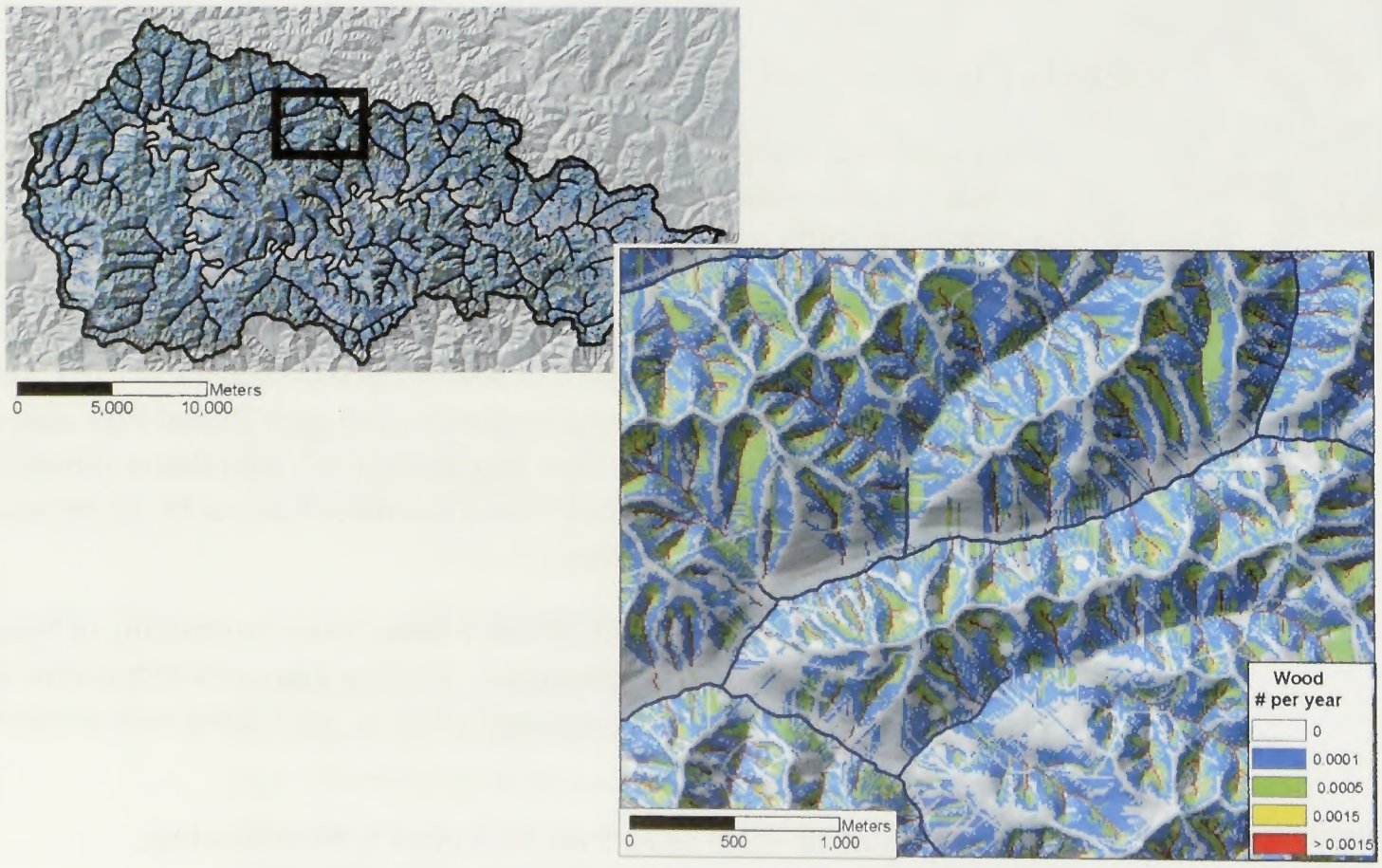
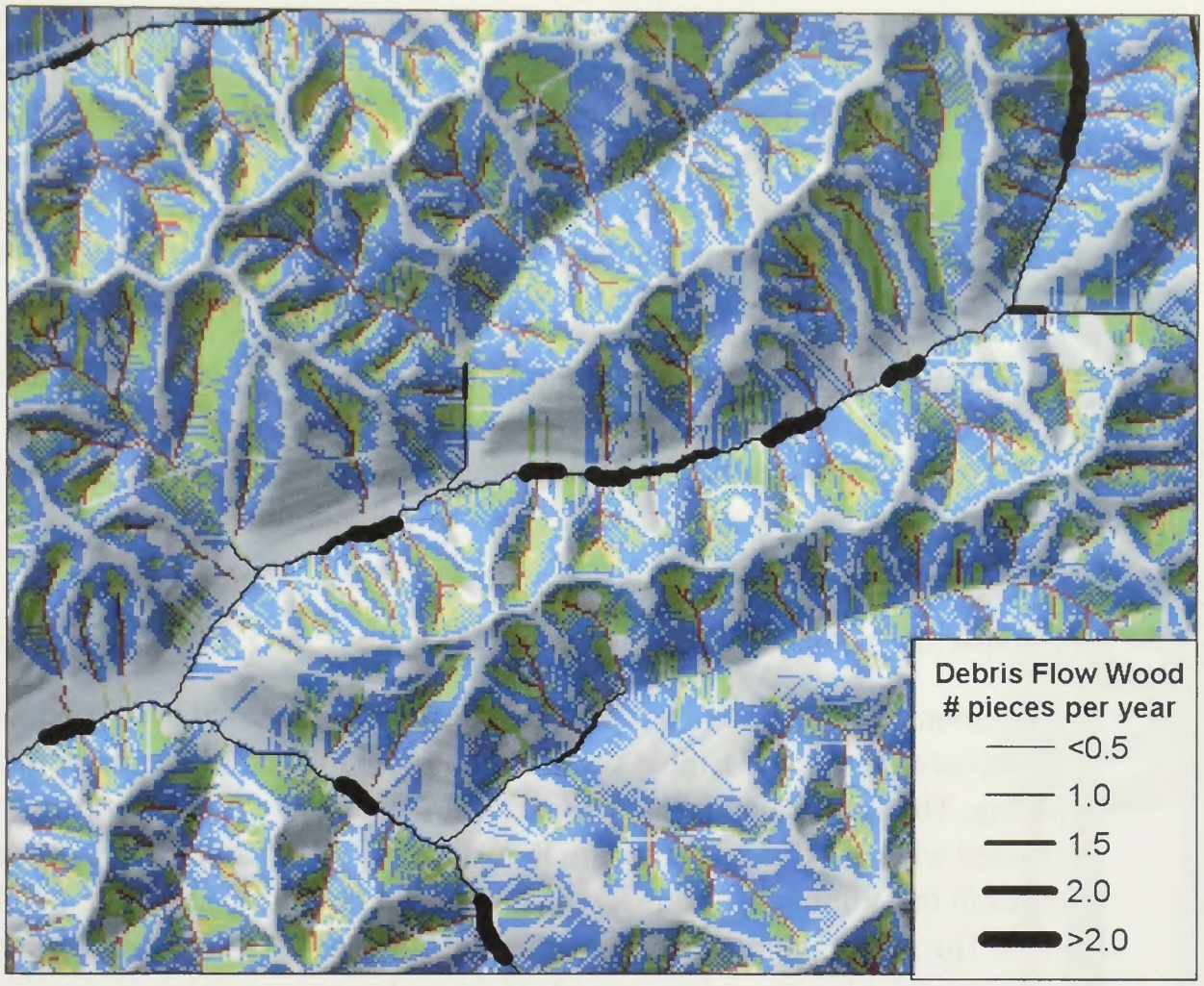


Figure 308. Debris flow inputs to fish-bearing streams occur at these low-order channel junctions.



Fish Productivity Index

A fish productivity index was developed for assessing the effects of wood recruitment on fish habitat. The index is used to assess potential fish habitat within a basin. The index is based on the assumption that available habitat is proportional to available channel area; (e.g., large channels can support more fish than small channels). Channel surface area is estimated as the product of channel width and channel length, determined from channel courses traced from a 10-m Digital Elevation Model. The available channel area is then modified using a species-specific measure of intrinsic habitat potential (Burnett et al. in press): an index that varies between zero and one as a function of channel gradient, mean annual flow, channel width, and valley width. (Both mean annual flow and channel width are calibrated functions of drainage area and mean annual precipitation, (Clarke et al. in review)).

A similar approach was used by Lawson et al. (Lawson et al. 2004) to estimate channel area available for coho production for basins in western Oregon. Summed over all channels in a basin, this index provides a simple, albeit course, measure of available habitat. It takes into account the channel length within a basin (channel density) and the habitat potential of those channels (via the intrinsic potential index). It can be used to rank basins in terms of potential habitat availability as discerned from these simple, topographically based criteria.

The potential effects of wood are incorporated into the index by the proportion of estimated wood recruitment relative to a potential maximum recruitment rate. This maximum rate is calculated for all forested areas in mature and structurally complex stands. This proportion, calculated for each reach, varies between zero and one. This proportion is related to effects on habitat based on the role of wood in creating pools. Although this is not the only function served by woody debris, it is an important one for which data exists from which to infer effects of wood on one aspect of habitat.

Pool spacing varies inversely with the number of pieces of large wood found in a channel (Montgomery et al. 1995, Beechie and Sibley 1997). Beechie and Sibley (1997), using data from northwest Washington, report a relationship between mean pool spacing, the number of pieces of wood per unit channel length, and channel gradient:

pool spacing (pools per channel width) = 2.7 - 4.6(slope x LWD/m) + 1.6(slope)

A minimum spacing of two pools per channel width occurred at a wood loading of 0.4 pieces per meter. Higher wood loadings did not result in smaller pool spacing. The assumption is that the maximum potential wood recruitment rate, obtained when all forested areas are in mature and structurally complex stands, results in this minimum spacing, which corresponds to the maximum number of pools. The maximum pool spacing, corresponding to the minimum number of pools, occurs when there is no wood. These endpoints, a minimum spacing of two pools per channel width and a maximum given by 2.7 + 1.6(slope) provide the potential range in the number of pools within a reach. This equation implies that the proportional change in the number of pools in a reach between full wood loading and no wood loading is:

Pmin = 2/(2.7+1.6*slope). Where: pmin is the proportion of the maximum number of pools expected in a reach; the maximum occurs when the reach is fully loaded with wood, the minimum (Pmin) occurs when there is no wood.

At zero slope this ratio is 74%; for a 5% channel, the ratio is approximately 19%. The ratio is an index of wood recruitment. If wood recruitment for a reach is equal to that calculated for a uniform mature and structurally complex forest cover (the maximum value), the index value is one. If recruitment is zero, the index value is given by Pmin. The index value for recruitment rates between the maximum and zero varies linearly from one to Pmin based on the proportion of the maximum recruitment rate. Potential habitat availability for each reach is then multiplied by the resulting wood index value. As wood recruitment rate goes to zero, the potential habitat availability is reduced by Pmin.



Appendix I. Water

This appendix provides supplemental material for the topics discussed within the chapters of this draft environmental impact statement that are related to water resources and riparian areas that are on BLM-administrated lands.

In this appendix:

Water Planning Criteria 1095

Source Water Watersheds for Public Water Systems 1120

Best Management Practices 1132

Water Planning Criteria

Analytical Question # 1

How do the alternatives affect peak flow estimates that exceed detection limits within the rain dominated hydroregion?

Analytical Assumptions

- Hydroregions are a physical classification of landscapes based on the form of precipitation with elevation, as predominantly rain, rain and snow, or snow. In the rain dominated hydroregion, removal of basal area is used as a surrogate for reductions in leaf area. Removal of basal area is expected to affect peak flows to varying degrees (Grant et al 2007 In Review).
- Ziemer (1981, 1998) found a non-statistical increase (4%) in peak flow for 80 year old conifer stands that were harvested where, 50% of the basal area was retained.
- Within the rain dominated hydroregion the effect of increased peakflow is roughly proportional to area cut. Patch size or arrangement is not a factor in explaining greater flow volume or differences in timing. In this analysis, 40% basal area removed is set as a 6th field watershed response threshold for events with return periods of >2years, where the percent change in peakflow is expected to be greater than the detection limit (Grant et al 2007 In Review).
- Research indicates the largest percent increases in peak flows apply to 100% regeneration harvested watersheds where all the basal area is removed, within the rain dominated hydroregion. For partial reductions in basal area by thinning, the inter-relationships of forest tree size, stocking, distribution and age affect leaf area, but not necessarily hydrologic processes. The 6th field watershed response threshold of 40% basal area removed, will be calculated by using the following assumptions:
- For BLM lands, the 10-year projection derived data layers will be used as a surrogate to determine basal area removed, using the acres of the ecology description attributes of stand establishment with legacy and stand establishment without legacy. For other lands, acres of less than 30% vegetative crown closure reclassed from the 1996 Interagency Vegetation Mapping Project TM will be used as a surrogate for removal of basal area. Any cell meeting this description is binned as basal area removed.
- For other lands, it is assumed that the percentage of basal area removed is the same for all planning time periods by 6th field watershed.
- This analytical procedure is viewed as a screening process to determine probable watersheds at risk for peak flow enhancement from removal of basal area in the precipitation dominated hydroregion. The output changes, depending on the climate, elevation and forest cover relationships.

Analytical Methodology and Technique

The technique relies on ARC GIS processes for analyzing spatial data. Logical and mathematical operations will be written as scripts, based on watershed analysis methodologies.

Step 1 –
Using the Hydroregions derived data layer (Planning Criteria #2 step 3), exclude any 6th field watersheds from further analysis that contain < 70% rain dominated areas. Mask the area of the remaining 6th filed watersheds that are not rain dominated. Build a new selected set labeled "Rain Dominated".

Step 2 –
For other lands, determine "Existing Condition Hydrologic Maturity" for forest vegetation by reclassing the 1996 classified Interagency Vegetation Mapping Project TM (IVMP) imagery. Table 258 will be used to construct the derived data layer.

Table 258. Vegetation Hydrologic Maturity Assignment to Land Cover Class.

Hydrologic Maturity	Land Cover Classes
Minimum Hydrologic Maturity	<30% total crown closure

Step 3 –
Intersect "Current Condition Hydrologic Maturity" (step 2) with the Rain Dominated 6th field watersheds selected set (step 1). Intersect the alternatives' 10-year projections vegetation structural stages with the Rain Dominated 6th field watersheds selected set (step 1).

Step 4 –
For BLM, use the alternatives' 10-year projections, to calculate the acres of basal area removed. Include the stand establishment ecology polygons (acres), with the attributes stand establishment with legacy and stand establishment without legacy for each rain dominated 6th field watershed.

Step 5 –
For other lands, calculate the acres of each rain dominated 6th field watershed that is minimum hydrologic maturity (step #2, Table 258).

Step 6 –
Sum the total basal area removed in acres, by each 6th field watershed, for the existing condition and each alternative (steps 4 and 5). Calculate total 6th field watershed acres, and basal area removed as a percent of the total.

Step 7 –
Conduct reference analysis. Replace the alternatives' 10-year projections coverage with the same attributes in step-4 with the no harvest and maximum harvest on commercial forest lands projections.

Analytical Conclusions

Rank the precipitation dominated 6th field watersheds that exceed 40% basal area removed as sensitive for peak flow increase.

Data Needs

- Classified 1996 imagery from the Interagency Vegetation Mapping Project TM (IVMP), including new openings under 10 years of age, current to 2005.
- GIS-derived data layer of hydroregions.
- GIS-derived data layer of vegetation hydrologic maturity.
- Watershed GIS coverage (for determining area and 6th field watersheds)
- By alternative, GIS-derived spatial data layer of 10-year projections stand establishment (acres).

Data Display

- Figure showing 6th field watersheds where basal area removed exceeds 40%, for the existing condition and with the application of each alternative's 10-year projection.

Analytical Question # 2

How do the alternatives affect peak flow estimates that exceed detection limits within the rain-on-snow hydroregion?

Analytical Assumptions

- Hydroregions are a physical classification of landscapes based on the form of precipitation with elevation, as predominantly rain, rain and snow, or snow. Rain-on-snow areas where shallow snow accumulations can come and go have been reported by Harr (1981, 1992) to be in the elevation range of 1200-3600 feet in western Oregon and from 2500 to 5000 feet in the southern Oregon Cascades (Lindell, pers.com.).
- The subwatershed level (USGS Sixth-field Hydrologic Unit Code) was chosen for the analysis, because it better approximates the BLM forest land pattern, and tributary streams are more sensitive to vegetation and runoff-related changes. This analysis level can also be viewed as an additional margin of safety in terms of describing effects.
- Forest openings commonly receive greater snow accumulation (2 to 3 times more snow water equivalent) than adjacent forests (Harr 1992). These openings also receive greater wind speeds and twice the amount of heat during rain-on-snow events, which provides greater melt compared to the mature forest (Harr 1981, 1992;

Storck 1997). Regeneration harvest or forest conversion will provide additional melt contributions under rain-on-snow conditions (Harr 1981, Storck 1997).

- Rain-on-snow occurrences normally correspond with a streamflow return period of 2 to 8 to years where pre-logging and post-logging regressions were significantly different (Harr 1992).
- Basin characteristics regression analysis with gauged watersheds of long-term record is an appropriate method of describing peak flows of various exceedance probabilities for unregulated streams in ungauged watersheds. Harris and Hubbard (1979) flood frequency equations were chosen as reference points; because they cover the various hydrologic regions in the plan area and have long-term records (10-70 years). The base period of streamflow data collection for use in the analysis was prior to maximum forest conversion in many watersheds. The data set may include some chance rain-on-snow events.
- The 2-year, 24-hour precipitation intensity is assumed to coincide with the 2-year, 24-hour discharge.
- U.S. Army Corps of Engineers studies (USACE 1956, 1998) show that the principal melt component in a rain-on-snow event is convection/condensation melt. This component is far larger than long-wave and short-wave radiation melt, rain melt, and ground melt. In a typical USACE rain-on-snow example, convection/condensation melt accounts for 70 percent of daily snowmelt quantities. Ground wind speed, warm air temperatures and nearly equivalent dewpoint temperatures are the drivers in the convection/condensation melt term.
- Basin characteristics regression analysis with gauged watersheds of long-term record is an appropriate method of describing peak flows of various exceedance probabilities for unregulated streams in ungauged watersheds. Harris and Hubbard (1979) flood frequency equations were chosen as reference points; because they cover the various hydrologic regions in the plan area and have long-term records (10-70 years). The base period of streamflow data collection for use in the analysis was prior to maximum forest conversion in many watersheds. The data set may include some chance rain-on-snow events.
- For other lands, it is assumed that the percentage of basal area removed is the same for all planning time periods by 6th field watershed.
- This analytical procedure is viewed as a screening process to determine probable watersheds at risk for peak flow enhancement from rapid melt of shallow snowpacks. The output changes, depending on the climate, elevation and forest cover relationships.

Analytical Methodology and Technique

The technique relies on ARC GIS GRID processes for analyzing spatial data. Logical and mathematical operations were written as scripts, based on watershed analysis methodologies. The analytical technique is an empirical approach patterned in part from the Washington State Department of Natural Resources Standard Methodology for Conducting Watershed Analysis 1997, (v. 4.0), Appendix C.

Step 1 -
Construct "Flood-Frequency Precipitation" data layer. Obtain precipitation frequency data for the 2-year 24-hour storm for the plan area (NOAA 1973) in raster format available online: [http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm]

Step 2 -
Intersect watershed boundaries with "Flood-Frequency Precipitation" data. Intersect the BLM watershed GIS theme with the flood-frequency precipitation derived data layer at the 6th-field HUC level.

Step 3 -
Determine "Hydroregions." Construct a derived data layer to include elevation bands of rain-dominated areas that are below the rain-on-snow zone; rain-on-snow zone (also called transitional) and snow-dominated zone that are above the rain-on-snow zone. District hydrologists will assign lower and upper elevation bounds for the rain-on-snow zone for all 6th-field watersheds wholly or partly contained in the plan area, based on the following criteria:

Lower Bounds of the Rain-On-Snow Zone

Use National Resources Conservation Service SNOWTEL data for January 1 snow accumulation elevation (Greenburg and Welch 1998), and local hydrologist observation, which may vary from 1200-2500 feet.

Upper Bounds of the Rain-On-Snow Zone

Use regionally established upper limit from hydrologist observation or literature or the onset of frozen soils, which may vary from 3600-5000 feet.

Step 4 -
Filter the "Hydroregions" derived data layer. Filter by 6th-field watershed, and exclude any subwatersheds from further analysis that contain only rain areas or only permanent snow areas or <10% rain-on-snow (transitional) areas. Make a new derived data layer labeled "Rain-on-Snow" selected from the set.

Step 5 –
Using the Rain-on-Snow selected set to separate the remaining 6th field watersheds by flood region (Harris and Hubbard 1979), online: [http://water.usgs.gov/software/nff_manual/or/oregon_AFrame_3.gif]

Step 6 -
Calculate 2-Year 24-Hour Streamflow, and the 5-Year 24-Hour Streamflow from USGS basin characteristics regression analysis method (Harris and Hubbard 1979) using GIS scripts.

2-Year 24-Hour Streamflow

Coast Region: $Q_{0.5}=4.59A^{0.96}(ST+1)^{-0.45}I^{1.91}$

Willamette Region: $Q_{0.5}=8.70A^{0.87}I^{1.71}$

Rogue-Umpqua Region: $Q_{0.5}=24.2A^{0.86}(ST+1)^{-1.16}I^{1.15}$

High Cascades: $Q_{0.5}=4.75A^{0.90}(ST+1)^{-0.62}(101-F)^{0.11}I^{1.17}$

where: $Q^{0.5}$= discharge in cubic feet per second (CFS) for a 2-year 24-hour recurrence interval event:

A = drainage area in square miles

ST = area of lakes and ponds in percent

F = forest cover in percent

I = 2-year 24-hour precipitation intensity in inches

5-Year 24-Hour Streamflow

Coast Region: $Q_{0.2}=6.27A^{0.95}(ST+1)^{-0.45}I^{1.95}$

Willamette Region: $Q_{0.2}=15.6A^{0.88}I^{1.55}$

Rogue-Umpqua Region: $Q_{0.2}=36A^{0.88}(ST+1)^{-1.25}I^{1.15}$

High Cascades: $Q_{0.2}=8.36A^{0.86}(ST+1)^{-0.81}(101-F)^{0.08}I^{1.30}$

where: $Q^{0.2}$= discharge in cubic feet per second (CFS) for a 5-year 24-hour recurrence interval event,

A = drainage area in square miles

ST = area of lakes and ponds in percent

F = forest cover in percent

I = 2-year 24-hour precipitation intensity in inches

Area of lakes and ponds include natural lakes, ponds, and impoundments. Forest cover is the watershed area greater than 10% forest cover, and is the hydrologic maturity cover classes A and B (step 7).

Step 7 –
Determine "Existing Condition Hydrologic Maturity" for forest vegetation, by reclassing the 1996 classified Interagency Vegetation Mapping Project TM (IVMP) imagery. The table below will be used to construct the derived data layer.

Table 259. Vegetation Hydrologic Maturity Assignment to Land Cover Class.

	Hydrologic Maturity	Land Cover Classes
A	Hydrologically Mature	>70% total crown closure AND <75% of the crown in hardwoods or shrubs
B	Intermediate Hydrologic Maturity	10%-70% total crown closure AND <75% of the crown in hardwoods or shrubs
C	Minimum Hydrologic Maturity	<10% total crown closure AND/OR >75% of the crown in hardwoods or shrubs
D	Non-Forested	Agricultural and Grazing Lands Open Water Lakes, Ponds, Reservoirs Inundated Wetlands Other naturally occurring open areas

Source: Department of Natural Resources, Hydrologic Change Module

Step 8 -
Intersect "Existing Condition Hydrologic Maturity" with the "Rain-on-Snow" 6th field watersheds selected set (step 4).

Step 9 -
Estimate snow depth and snow water equivalent to create an "Estimated Snow-water Equivalent" derived data layer.

Obtain the Topographic Data theme for Rain-on-Snow" 6th field watersheds selected set (step 4) and build a raster (cell) derived data layer.

Solve the following two snow water equivalent (SWE) equations for the topographic data theme by writing scripts (Greenburg and Welch 1998):

Northwest Oregon SWE =0.009*Elevation-21.66 *R

Southwest Oregon SWE =0.006*Elevation-19.53*R

where: SWE = February 1 snow-water equivalent in inches.
Elevation = elevation in feet.
R = snowwater equivalent ratio to adjust for cover types

The division between northwest and southwest Oregon regions (for equations) will be determined by an eastward line following the southern edge of the Siuslaw subbasin in the Coast Range to the southern edge of the Willamette subbasin through the Willamette Valley and the Cascades. The line is formed by watersheds:

Lower Siuslaw River	1710020608
Upper Siuslaw River	1710020601
Upper Coast Fork Willamette	1709000203
Row River	1709000201
Hills Creek Reservoir	1709000105
Upper Middle Fork Willamette	1709000101

Snow water equivalent (SWE) values calculated are assumed to represent snow accumulation in hydrologically mature forests; these must be modified to account for variations in accumulation between different land use/cover types.

Table 260. Vegetation hydrologic maturity and snow water equivalent ratios.

	Vegetation Hydrologic Maturity (step 7)	Snow-water Equivalent Ratio (R)
A	Hydrologically Mature	1
B	Intermediate Hydrologic Maturity	1.5
C	Minimum Hydrologic Maturity	2
D	Non-Forested	2

Populate the two snow water equivalent scripts with the snow-water equivalent ratios (R) for the existing condition for the northwest and southwest Oregon areas using classified IVMP data (Step 7), as seen in the table above.



Step 10 -
Determine One-Day Snowmelt for a 24 hour design storm for the existing condition by writing scripts. This procedure uses equations from the U.S. Army Corp of Engineers (1998).

For heavily forested or partly forested areas (step 7 land cover classes A and B):

$$M = (0.074 + 0.007P)(T - 32) + 0.05$$

For minimum forest or open areas (step 7 land cover classes C and D):

$$M = (0.029 + 0.0084kv + 0.007P)(T - 32) + 0.09$$

where: M = snowmelt, in/day
v = wind velocity, miles per hour
P_r = rate of precipitation, in./day
T_a = temperature of saturated air, at 10-feet level, °F
k = basin wind coefficient. Use 0.4 for heavily to partly forested areas (hydrologic maturity land cover classes A, and B), and 0.9 for open areas (hydrologic maturity land cover class C and D).

Calculate snowmelt in each hydrologic maturity land cover cell for the existing condition. If the calculated snowmelt (M) for a given scenario exceeds the estimated snow equivalent (SWE), set M = SWE; also, if T_a is ≤ 32 °F, M = 0.

Temperature

Storm temperature varies primarily with elevation. Determine the average storm temperature (Ta °F) for each cell area based on generalized regional lapse-rate equations:

Western Oregon = 50 - (.0033 * E)

where: E = elevation in feet

Wind speed

Local wind speed primarily depends on the vegetative cover, with mature forest canopies significantly reducing the wind speed at the interface between the snowpack and the air. Daily average windspeed (mph) with a 50% exceedance rate (% of days) for an average storm for western Oregon will be used. This corresponds to an estimated 15 mph.

Precipitation

Rate of precipitation is calculated, using the 2 year 24 hour precipitation, in. (step 1).

Step 11 –
Calculate water available for runoff.

Perform a zonal mean for each 6th field watershed:

$$M = \frac{A_1M_1+A_2M_2+\ldots A_nM_n}{A_1+A_2+\ldots A_n}$$

where: M = snowmelt, in.
A = area, acres

Calculate water available for runoff for the existing condition by:

WAR = M + P

where: WAR = water available for runoff, in./day
M = snowmelt, in./day
P = 2-year 24-hour precipitation, in.

Add the snowmelt (M) to the 2-year 24-hour precipitation (P) and track for each 6th-field watershed in the 'Rain-on-Snow" derived data layer (step 4).

Step 12 –
Estimate peak flow for the existing condition. Estimate peak flows for each 6th field watershed (filtered set, step 4) by substituting the water available for runoff value (step 11) for the existing condition into the 2-year 24-hour streamflow regression equations (step 6) for the precipitation term. Compare the result with the 5-year 24-hour streamflow and indicate where it is exceeded.

Step 13 –
Estimate peak flow for the alternatives. Repeat steps 7 to 12 for the 10-year projection by reclassing the expected condition of vegetation (step 7). Intersect the ecology stand establishment with attribute without legacy from the Options model derived data layer for the 10-year projection for each alternative with the "Existing Condition Hydrologic Maturity" for forest vegetation. Substitute cover class C for these areas.

Step 14 –
Conduct reference analysis. Replace the alternatives 10-year projections with the no harvest and maximum harvest on commercial forest lands reference analysis derived data layers. Order the analysis as in step 13.

Step 15 –
As a sensitivity analysis for the design storm, one standard error of the estimate will be applied to the USACE snowmelt equation for temperature and wind speed. For temperature, use 55 - (.0033 * E), where E = elevation in feet. For windspeed, use 25 mph. Modify scripts and rerun the analysis.

Analytical Conclusions

- Rank those subwatersheds that exceed the 5-year 24-hour peakflow as sensitive for estimated peak flow increase.

Data Needs

- National Oceanic and Atmospheric Administration (NOAA) 2-year 24-hour Precipitation Frequency map of Oregon. Available in GIS raster format online: [http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm]
- USGS Flood Regions. Available in GIS raster format online: [http://water.usgs.gov/software/nff_manual/or/oregon_AFrame_3.gif]
- U.S. Weather Service Windspeed Frequency.
- Classified 1996 imagery from the Interagency Vegetation Mapping Project TM (IVMP), including new openings under 10 years of age, existing to 2005.
- GIS-derived data layer of hydroregions.
- GIS-derived data layer of vegetation hydrologic maturity.
- GIS-derived data layer of snow-water equivalent.
- GIS-derived data layer of snowmelt.
- Topography GIS coverage.
- Watershed GIS coverage.
- Waterbodies GIS coverage.
- By alternative, GIS derived data layer of 10-year projection stand establishment.

Data Display

- Figure of hydroregions for the plan area.
- Figure showing 6th-field subwatersheds where the 2-year 24-hour peakflow exceeds the 5-year 24-hour peakflow for the existing condition, for each alternative's 10-year projection.

Analytical Question #3

How will the alternatives affect road sources of fine sediment delivery to stream channels?

Analytical Assumptions

This analysis is based on use of a reference road. The analytical technique is an empirical approach patterned in part from the Washington State Department of Natural Resources Standard Methodology for Conducting Watershed Analysis 1997, (v. 4.0), Appendix B.

The reference road will use the following assumptions: An in-sloped road with a ditch; moderate traffic (pickups sedans, and log haul <50% of the time); cut-slope gradient 1:1 (horizontal to vertical) and fill-slope gradient 1.5:1; initial ground cover density of zero on cut and fill slopes; sustained grade of 5-7 percent; and an average cross-drain spacing of 500 feet.

Proportions of the total long-term average road erosion rates attributed to the components of the standard road prism (Swift 1984, Burroughs and King 1989, Sullivan and Duncan 1980, Megahan unpublished data) are:

- Road Tread 40%
- Cutslope and Ditch 40%
- Fillslope 20%

Roads differ in their inherent erodibility, or erosion potential, due to the geology, or parent material on which they are constructed as seen in Table 261. Sediment yields from older roads with undisturbed ditches are much smaller than sediment yields from newer roads or roads with disturbed ditches. Maintenance of ditchlines can increase sediment yields.

Table 261. Basic Erosion Rates.

		Road Age	
General Category	**Geologic Parent Material**	**New 0-2 Years**	**Old > 2 Years**
High	Mica schist, Volcanic ash, Highly weathered sedimentary	110	60
High/Moderate	Quartzite, Course-grained granite	110	30
Moderate	Fine-grained granite Moderately weathered rock Sedimentary rocks	60	30
Low	Competent granite, Basalt, Metamorphic rocks, Relatively unweathered rocks	20	10

(Note: Numbers represent erosion rates in tons/acre of road prism/year.)

Sources: Kochendorfer, J. N. and J. D. Helvey 1984; Hayden et al. 1991; Megahan and Kidd 1972; Reid and Dunne 1984; Sullivan and Duncan, U.S. Forest Service unpublished data.

The basic erosion rate for road erodibility is decreased by vegetative cover and surface roughness on cut and fills slopes. Table 262 shows reduction factors from the basic erosion rate.

Table 262. Groundcover Correction Factor for Cut and Fill Slopes

Ground Cover Density Factor	Factor
>80%	0.18
50%	0.37
30%	0.53
20%	0.63
10%	0.77
0%	1.00

Sources: Megahan 1991, Burroughs and King 1989, Megahan unpublished data.

The basic erosion rate for road erodibility is decreased by road tread surfacing. Table 263 shows reduction factors based on types of surfacing.

Table 263. Factors for Road Tread Surfacing.

Surfacing Material Factor	Factor
Paved	0.03
Gravel, greater than 6 inches deep	0.2
Native soil/rock	1.00

The basic erosion rate for road erodibility is increased by road traffic and wet weather haul on natural surface and gravel roads. Table 264 shows erodibility increase factors based on precipitation bands and traffic level.

Table 264. Traffic and Precipitation Factor.

	Annual Precipitation		
Traffic Use/Road Category	<47 inches	47 inches – 118 inches	>118 inches
Heavy Traffic/Active Mainline	20	50	120
Moderate Traffic/Active Secondary	2	4	10
Light Traffic/Non Active	1	1	1

Sources: Reid and Dunne 1984; Sullivan and Duncan unpublished

Sediment Delivery

- Sediment delivery to streams is affected by the road drainage system design including road prism shape, proximity of the road to the stream channel, and length of road draining directly into a stream at crossings.
- Sediment delivery to streams by road segment: Assume that a road segment does not deliver if the road does not cross a stream channel.
- Sediment delivery to streams by ditches: Assume 100% delivery of sediment to streams from the road prism and cutslope before application of factors.

- Sediment delivery to streams by diffuse sources: Assume 10% delivery of sediment to streams from the cutslope before application of factors.
- Best Management Practices can substantially reduce sediment delivery from roads.

Sediment Delivery Distance

- Roads near ridges have little direct effect on sediment delivery to streams.
- Generalized distances for sediment filtration effectiveness occur much sooner (25-100 feet) for diffuse sources of sediment delivery compared to concentrated sources (200 feet), such as road ditch lines draining into the riparian area (CH2MHill 1999).
- Wemple (1998 cited in Jones et al 2000) found that road segments that have stream connection pathways such as roadside ditches have potential to deliver surface eroded sediment to streams. Road segments not connected to streams by ditch lines or gullies or having more than 25 to 100 feet of filtering forest floor duff and vegetation (depending on slope, soil properties, and surface roughness) between them and a stream are usually not at risk of delivering sediment to streams.
- Below culverts, sediment travel distance in streams decreases with increasing roughness, such as debris and obstructions (Brake et al. 1997).
- Concentrated and diffuse sources of sediment delivery in this analysis are assumed to be within 200 feet of stream channels.

Road Traffic

- Frequent heavy truck traffic can grind resistant road surfacing such as gravels into smaller particles that can wash into ditchlines during rainstorms. Material type, traffic level and rate determine the quantity of sediment available for transport, while the rainfall determines the transport capacity (Reid and Dunne 1984).

Analytical Methodology and Technique

The technique relies on ARC GIS GRID proeesses for analyzing spatial data. Logieal and mathematical operations were written as seripts, based on watershed analysis methodologies. The analysis is performed by fifth-field watersheds within the plan area.

Step 1 -
Build a basie erosion rate (BER) data layer from the BLM GIS Geology theme by matehing the parent materials in the Table 261 Basic Erosion Rates, to the theme mapped designations with input from Geologist and Soil Scientist.

Step 2 -
Build a derived data layer labeled "Streams" from the BLM GIS Watercourses data theme that ineludes all intermittent and perennial streams.

Step 3 -
Buffer the Streams derived data layer (Step 2) to 200 feet and make a new derived data layer labeled "Sediment Delivery Buffer".

Step 4 -
Interseet and elip BLM GIS GTRN (roads) data theme with the sediment delivery buffer derived data layer (step 3) for all lands. Label new derived data layer "Stream Proximity Roads".

Step 5 –
Refine the stream proximity roads derived data layer (step 4) and exelude road segments that do not cross stream ehannels. Road segment origin must be further than 30 feet from streams to be exeluded.

Step 6 -
Build a table of speeifie vegetative correetion faetors by fifth-field watershed using Table 262 Groundcover Correetion Faetor for Cut and Fill Slopes.

Step 7 -
Use seleeted Prism Climate Model outputs to build a derived data layer labeled "Average Annual Preeipitation" by fifth-field watershed. From the Oregon Climate Service PRISM Produets page, online: [http://www.ocs.orst.edu/prism/produets/] seleet the 30-aresee (800m) normal grids for preeipitation for the period 1971-2000.

Step 8 -
Caleulate the traffic faetor from Table 261, Traffie and Preeipitation Faetors by interseeting the preeipitation dominated and rain-on-snow hydro region (from peakflow planning eriteria) with the average annual preeipitation data layer (step 7) and develop a new data layer labeled "Traffie faetors." Classify into three preeipitation bands: <47", 47-118" and >118" from Table 264. Assign traffie factors for moderate traffie where <47" equal 2, 47-118" equal 4, and >118" equal 10.

Step 9 –
For each road segment, add attributes to the data tables for the stream proximity roads derived data layer selected set (step5). Calculate the road segment lengths by surface type within the BLM GIS GTRN roads data layer for BLM and other ownerships and add to the data tables. BLM includes BLM controlled roads and private roads in the planning area from BLM GIS GTRN (roads) theme.

Step 10 -
For each road segment within the stream proximity roads derived data layer selected set (step5) build a logical calculation sequence as scripts to determine potential sediment delivery from the cut slope, road tread and fill slope (calculations 1, 2 and 3) by:

Existing Condition

Return basic erosion rate (BER) value from the basic erosion rate derived data layer of > two year old road age (step 1).

Return road surface type factor (RST) (from Table 178).

Return ground cover density (GCD) factor (step 6).

Return traffic factor (TF) (step 8).

Calculate:

1 [BER * PCD * GCD] * [((cutslope width) + (ditch width) + (road prism width - road tread width / 2)) * road length]/ 43560

2 *where RST = 0.03:* [BER * RT * road surface type factor * [road tread width * road length]/43560

else: [BER * RT * RST] * [TF] * [road tread width * road length]/43560

3 [(BER * FS * GCD) * 0.10] * [((fillslope width) + (road prism width - road tread width / 2)) * road length]/43560

Sum 1, 2 and 3.

Alternative 10 Year Projection

Repeat existing condition calculation except:

Step 1,
Table 258. Return basic erosion rate (BER) value from the basic erosion rate derived data layer of < 2 year old road age.

Step 9.
Calculate the road segment lengths for permanent aggregate and natural surface road for the 10 year projection. No paved roads are planned.

Develop a ratio:

$$\frac{\text{length of road in the sediment delivery buffer (step 3)}}{\text{length of road in the 10 year projection sample}}$$

Multiply this ratio by:

Table 265. Projected Permanent Roads by Alternative[1]

Alternative	Rocked Roads (miles)	Natural Roads (miles)
No Action	250.31	94.49
Alternative 1	384.98	128.44
Alternative 2	494.55	109.64
Alternative 3	393.66	131.95

[1] Based on Dave DeMoss road construction estimates for timber volume per foot of road for sum of regeneration harvests, thinning and partial cuts for all districts.

Develop a ratio:

$$\frac{\text{potential sediment delivery in the sediment delivery buffer}}{\text{length of road in the sediment delivery buffer (feet)}}$$

Multiply this ratio by the adjusted road length. Convert to potential sediment delivery; tons/mile/year.

Step 11 –
Calculate data for display table.

Sum miles of stream proximity roads (inside the sediment delivery buffer) for each Alternative by surface type; paved, aggregate and natural for BLM and other land ownerships for each watershed. Sum all watersheds.

Calculate potential sediment delivery for each alternative in tons per mile of road by surface type: paved, aggregate and natural for BLM and other land ownerships for each watershed. Sum categories for all watersheds.

Calculate potential sediment delivery in tons mile^2/year for BLM and other land ownerships for each watershed. Sum potential sediment delivery for all watersheds for BLM and other land ownerships and divide by the respective landbase.

Table 266. Factor definition table.

Factor	Factor Definition
BER	Basic erosion rate in tons/acre/year
PCD	Proportion of cutslope and ditch erosion to the roaded cross section; 0.40
RT	Proportion of road tread erosion to the roaded cross section; 0.40
FS	Proportion of fill slope erosion to the roaded cross section; 0.20
GCD	Groundcover density factor (0.18-1.0)
RST	Road surface type factor; 0.03 paved, 0.2 gravel and 1.0 native surface
TF	Traffic factor within precipitation dominated area for annual precipitation <47 inches equal 20, 47-118 inches equal 50 , >118 inches equal 120
Cut slope width	Cut slope width in feet; generalized 15 feet
Ditch width	Ditch width in feet; generalized 3 feet
Road tread width	Road tread width in feet; generalized 14 feet
Road prism width	Road prism width in feet; generalized 20 feet
Fill slope width	Fill slope width in feet; generalized 10 feet
Road length	Road length in feet, up gradient of stream crossings to the buffer limit
43560	Factor to convert ft^2 to acres

Analytical Conclusions

- Rank of alternatives by their effect on road sources of fine sediment delivery to stream channels.
- Comparison of sediment delivery to that which occurs under the existing condition.

Data Needs

- Proposed new road 10-year projection, by alternative.
- GIS derived data layer of basic erosion rate.
- GIS derived data layer of stream proximity roads derived data layer for the existing condition.
- GIS derived data layer of stream proximity 10-year projection roads for each alternative.
- Prism Model of average annual precipitation for the precipitation hydro region.

Data Display

Populate the following table:

Table 267. Potential sediment delivery, by Alternative from roads.

Alternative	Roads Contributing to Sediment Delivery[2] miles		Potential Sediment Delivery[3] tons/mile/year		Potential Sediment Delivery[4] tons/mile²/year	
Existing[1]	BLM	Other	BLM	Other	BLM	Other
Natural						
Aggregate						
Paved						
Total						
No Action New Roads, 10-year projection	BLM		BLM		BLM	
Natural						
Aggregate						
Paved						
Total						
Alternative 1 New Roads, 10-year projection						
Natural						
Aggregate						
Paved						
Total						
Alternative 2 New Roads, 10-year projection						
Natural						
Aggregate						
Paved						
Total						
Alternative 3 New Roads,10-year projection						
Natural						
Aggregate						
Paved						
Total						

[1] BLM includes BLM controlled roads and private roads in the planning area from BLM GIS GTRN (roads) theme.
[2] Includes road segments within 200 feet of a stream channel.
[3] Averaged per mile of road by surface type for each 5th field watershed and averaged for the planning area.
[4] Potential sediment delivery in tons/year for each 5th field watershed divided by each 5th field watershed area for BLM and other lands and averaged for the planning area.

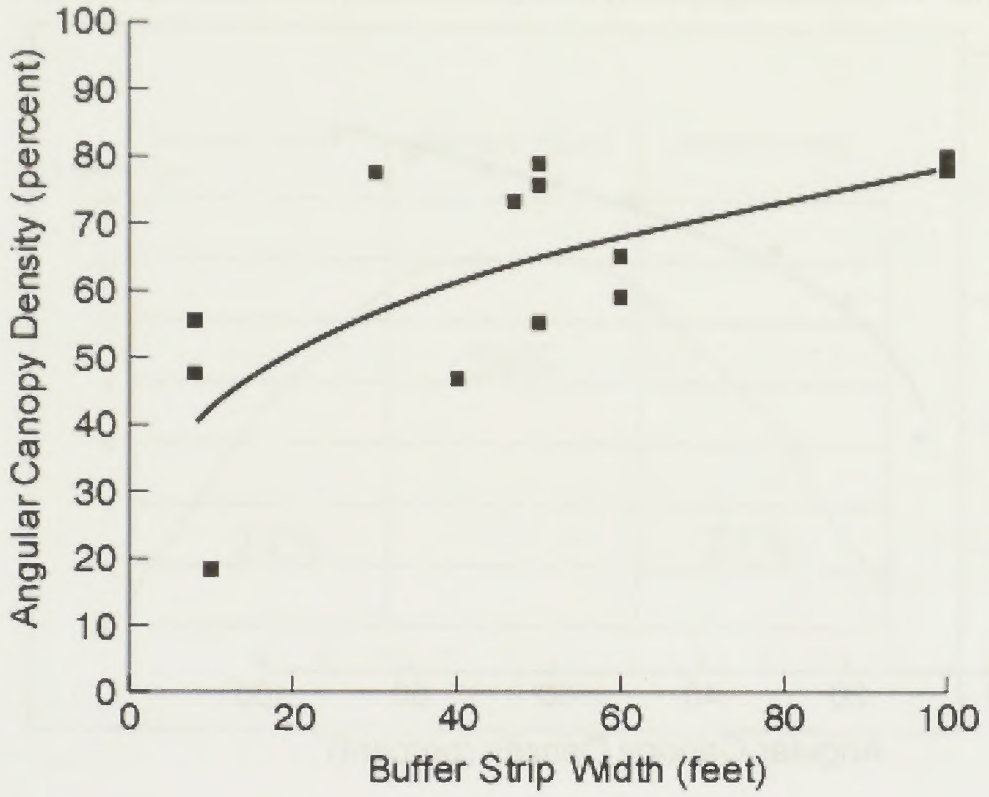
Analytical Question # 4

To what extent will each alternative maintain effective shade along streams, lakes and wetlands?

Analytical Assumptions

- Maintaining streamside shade is a surrogate for meeting the Department of Environmental Quality (DEQ) temperature standard. Northwest Forest Plan Temperature Total Maximum Daily Load (TMDL) Implementation Strategies (2005) demonstrate how retention and variable retention areas meet shade goals and the DEQ temperature standard. These are described as primary and secondary shade zones. The derivation of these zones is based on factors including seasonality of streams, topography, forest vegetation, and solar physics.
- Perennial streams are considered in this analysis, because of the influence that forest shade has on maintaining cool water temperatures during the summer.
- Mountainous topography can block solar radiation through parts of the day along many stream segments.
- Forest trees near stream channels and dense stands can block solar radiation and cast shadows across the stream. Angular canopy density (ACD) is the measure of canopy closure as projected in a straight line from the stream surface to the sun, as it varies through the day. The ACD value for a given buffer depends on the spacing of forest crowns. As vegetation becomes more open through wider spacing, more width of vegetation is needed to achieve the same ACD for the similar vegetation with closer spacing. Higher ACD is achieved with lower sun angles and higher canopy density.

Figure 309. Angular canopy density (ACD) and buffer widths for small streams in western Oregon (Brazier and Brown 1972). It illustrates that a buffer strip width of 60 feet will result in an angular canopy density of 65 percent.



Effective shade is the total amount of radiant energy prevented from reaching a stream in a solar day. Because sun path and azimuth changes throughout the day forest vegetation has different efficiencies in blocking radiation for different time periods. As seen in Figure 312 (below), most solar heating occurs between 10:00 a.m. and 2:00 p.m. Park (1993) has shown that the width of primary riparian streamside areas will vary as a function of tree height and terrain slope as viewed in the Primary Shade Zone Table, included below after Figure 312.

The planning criteria assume the secondary shade zone is defined as the outer edge of the primary shade zone to 100 feet. There is marginal improvement of ACD past 100 feet (Figure 309 above). Significant temperature rises do not occur when effective shade is ≥ 80% (Figures 310 and 311 below).

Figure 310. Angular canopy density (ACD) and stream shade (Park 1991).

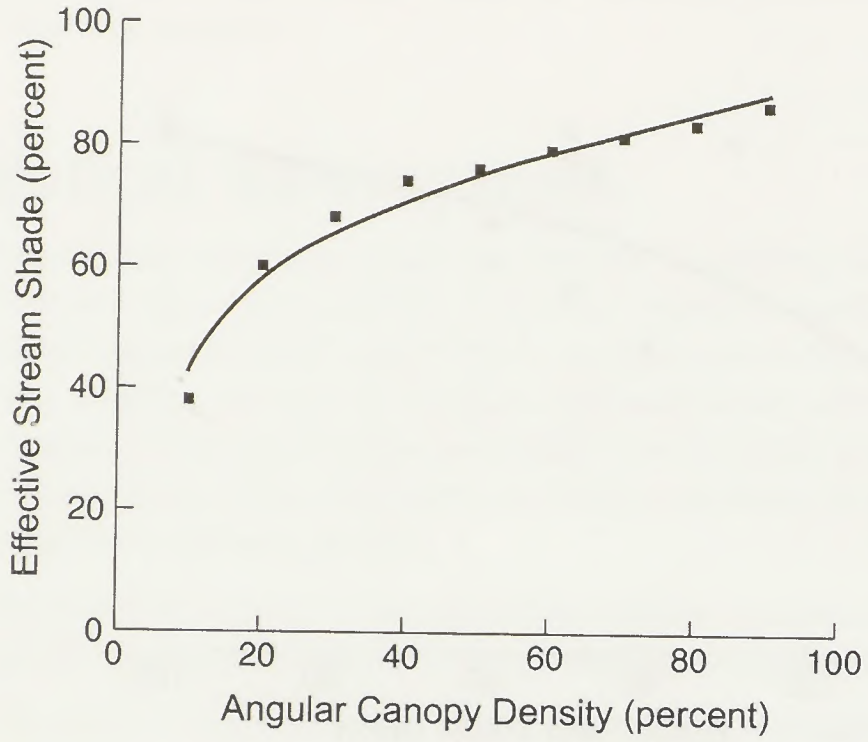


Figure 311. Effective Stream Shade and Change in Stream Temperature

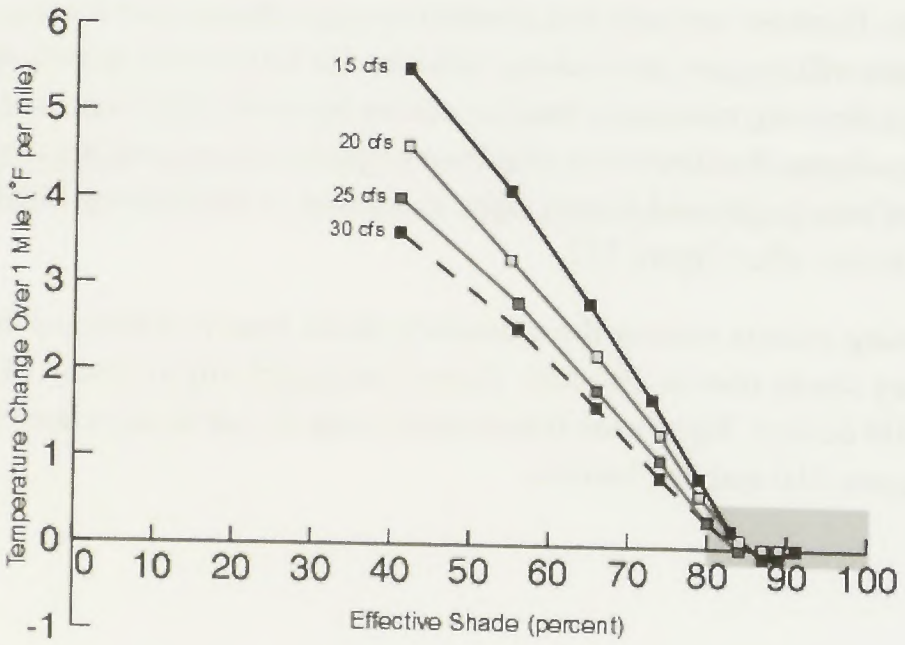


Figure 312. Solar Pathfinder (43° to 49° N Lat., Boyd 1999).

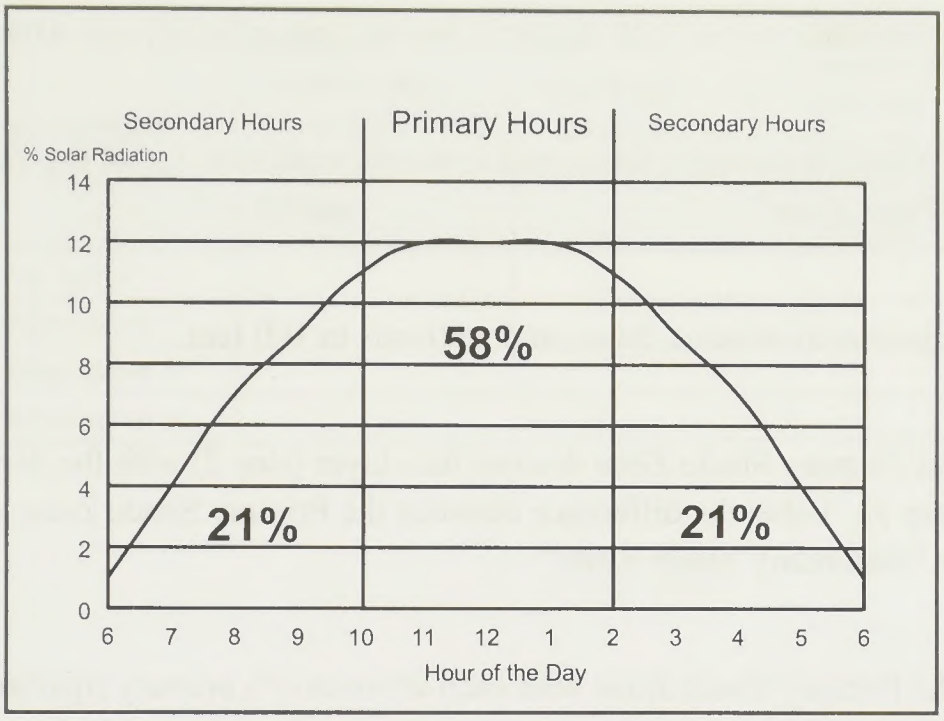


Table 268. Primary Shade Zone Distance of Riparian Trees (In Feet)

height of tree	Hill slope <30%	Hill slope 30 to 60%	HILL SLOPE >60%
Trees < 20 feet	12	14	15 feet
Trees 20 to 60 feet	28	33	55 feet
Trees >60 to 100 feet	50	55	60 feet

Source: Northwest Forest Plan Temperature TMDL Implementation Strategies, 2005.

Forest treatments are assumed to fully meet effective shade and water quality standards within primary and secondary shade zones along streams, lakes, and wetlands when the following criteria are met:

- Table 268 will be used to determine the width of the primary shade zone. Vegetation thinning in the primary shade zone will not result in less than 80% effective shade.
- Vegetation thinning in the secondary shade zone will not result in less than 50% canopy closure post harvest.

For modeling purposes, 60 feet width will be used to define the boundary of the primary shade zone for all combinations of topography and vegetation, and 100 feet will be used to define the boundary of the secondary shade zone.

Analytical Methodology and Technique

Step 1 -
Reclassify the watercourses GIS theme to derive a perennial stream data layer.

Step 2 -
Buffer the perennial streams, lakes, and wetlands to 60 feet. Label this derived data layer "Primary Shade Zone".

Step 3 -
Buffer the perennial streams, lakes, and wetlands to 100 feet.

Step 4 -
Intersect the Primary Shade Zone derived data layer (step 2) with the derived data layer derived (step 3). Label the difference between the Primary Shade Zone and the boundary of 100 feet "Secondary Shade Zone".

Step 5 -
Intersect the Primary Shade Zone with each alternative's primary riparian retention area. Calculate the miles of perennial stream not meeting the primary shade zone.

Step 6 -
Intersect the Secondary Shade Zone with each alternative riparian variable management riparian area that meets 50% canopy closure post harvest. Calculate the miles of perennial stream not meeting the secondary shade zone.

Analytical Conclusion

- Rank of alternatives by the extent that each alternative riparian area meets the primary and secondary shade zones on BLM-managed lands.

Data Needs

- GIS Watercourses data theme
- GIS derived data layer or detailed description of each alternative's full riparian retention and variable retention areas.



Data Display

Table 269. Comparison of Alternatives Not Meeting Effective Shade for Perennial Streams.

Alternative	Perennial Streams Not Meeting Primary Shade Zones (Miles)	% of Total Perennial Stream	Perennial Stream Not Meeting Secondary Shade Zones (Miles)	%of Total Perennial Stream
No Action				
Alternative 1				
Alternative 2				
Alternative 3				

Source Water Watersheds for Public Water Systems

The following table contains a list of source water watersheds for public water systems in the planning area. In many cases, the BLM administers a small portion of the watersheds.

Table 270. Source water watersheds with BLM-administered lands in the planning area.

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100003	ADAIR VILLAGE WATER SYSTEM	WILLAMETTE RIVER		8144	
4100003	ADAIR VILLAGE WATER SYSTEM	WILLAMETTE RIVER			226461
4100003	**ADAIR VILLAGE WATER SYSTEM**	**SUBTOTAL**	**650**	**8144**	**226461**
4100152	CITY OF BROWNSVILLE	CALAPOOIA RIVER		5254	
4100152	CITY OF BROWNSVILLE	CALAPOOIA RIVER			94920
4100152	**CITY OF BROWNSVILLE**	**SUBTOTAL**	**1500**	**5254**	**94920**
4100157	CANBY UTILITY BOARD	MOLALLA RIVER		2892	
4100157	CANBY UTILITY BOARD	MOLALLA RIVER			84687
4100157	**CANBY UTILITY BOARD**	**SUBTOTAL**	**12000**	**2892**	**84687**
4100169	CITY OF CANYONVILLE	CANYON CREEK		13247	
4100169	CITY OF CANYONVILLE	CANYON CREEK			9408
4100169	**CITY OF CANYONVILLE**	**SUBTOTAL**	**1265**	**13247**	**9408**
4100171	CITY OF CARLTON	PANTHER CREEK		1070	
4100171	CITY OF CARLTON	PANTHER CREEK			1003
4100171	**CITY OF CARLTON**	**SUBTOTAL**	**1570**	**1070**	**1003**
4100187	CLACKAMAS RIVER WATER-CLACKAMAS	CLACKAMAS RIVER		8399	
4100187	CLACKAMAS RIVER WATER-CLACKAMAS	CLACKAMAS RIVER			159669
4100187	**CLACKAMAS RIVER WATER-CLACKAMAS**	**SUBTOTAL**	**90000**	**8399**	**159669**
4100199	BEAVER WATER DISTRICT	BEAVER CREEK		1649	
4100199	BEAVER WATER DISTRICT	BEAVER CREEK			17000
4100199	**BEAVER WATER DISTRICT**	**SUBTOTAL**	**500**	**1649**	**17000**
4100202	COLTON WATER DISTRICT	JACKSON CREEK		598	

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100202	COLTON WATER DISTRICT	JACKSON CREEK			1536
4100202	**COLTON WATER DISTRICT**	**SUBTOTAL**	**1200**	**598**	**1536**
4100213	CITY OF COQUILLE	COQUILLE RIVER		67076	
4100213	CITY OF COQUILLE	RINK CREEK		0	
4100213	CITY OF COQUILLE	COQUILLE RIVER			248930
4100213	CITY OF COQUILLE	RINK CREEK			429
4100213	**CITY OF COQUILLE**	**SUBTOTAL**	**4300**	**67076**	**249359**
4100225	CITY OF CORVALLIS	SOUTH FORK ROCK CREEK		52	
4100225	CITY OF CORVALLIS	GRIFFITH CREEK			1051
4100225	CITY OF CORVALLIS	NORTH FORK ROCK CREEK			2155
4100225	CITY OF CORVALLIS	SOUTH FORK ROCK CREEK			3177
4100225	CITY OF CORVALLIS	WILLAMETTE RIVER			40593
4100225	**CITY OF CORVALLIS**	**SUBTOTAL**	**50101**	**52**	**46975**
4100236	CITY OF COTTAGE GROVE	LAYING CREEK		80	
4100236	CITY OF COTTAGE GROVE	ROW RIVER		37205	
4100236	CITY OF COTTAGE GROVE	LAYING CREEK			36989
4100236	CITY OF COTTAGE GROVE	PRATHER CREEK			3482
4100236	CITY OF COTTAGE GROVE	ROW RIVER			160279
4100236	**CITY OF COTTAGE GROVE**	**SUBTOTAL**	**8500**	**37285**	**200750**
4100239	LONDON WATER CO-OP	BEAVER CREEK		253	
4100239	LONDON WATER CO-OP	BEAVER CREEK			615
4100239	**LONDON WATER CO-OP**	**SUBTOTAL**	**50**	**253**	**615**
4100246	CITY OF CRESWELL	COAST FORK WILLAMETTE RIVER		26141	
4100246	CITY OF CRESWELL	COAST FORK WILLAMETTE RIVER			96969
4100246	**CITY OF CRESWELL**	**SUBTOTAL**	**3380**	**26141**	**96969**
4100248	CITY OF DALLAS	RICKREAL CREEK		2874	
4100248	CITY OF DALLAS	RICKREAL CREEK			15092

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100248	**CITY OF DALLAS**	**SUBTOTAL**	**12900**	**2874**	**15092**
4100250	MILO ACADEMY	LICKEY CREEK		227	
4100250	MILO ACADEMY	SOUTH UMPQUA RIVER		10090	
4100250	MILO ACADEMY	LICKEY CREEK			251
4100250	MILO ACADEMY	SOUTH UMPQUA RIVER			11365
4100250	**MILO ACADEMY**	**SUBTOTAL**	**195**	**10317**	**11616**
4100254	CITY OF DEPOE BAY	NORTH DEPOE BAY CREEK		7	
4100254	CITY OF DEPOE BAY	SOUTH DEPOE BAY CREEK		29	
4100254	CITY OF DEPOE BAY	NORTH DEPOE BAY CREEK			521
4100254	CITY OF DEPOE BAY	ROCKY CREEK			3396
4100254	CITY OF DEPOE BAY	SOUTH DEPOE BAY CREEK			2736
4100254	**CITY OF DEPOE BAY**	**SUBTOTAL**	**1060**	**36**	**6653**
4100260	CITY OF DRAIN	ALAN CREEK		235	
4100260	CITY OF DRAIN	BEAR CREEK		1133	
4100260	CITY OF DRAIN	ALAN CREEK			415
4100260	CITY OF DRAIN	BEAR CREEK			2235
4100260	**CITY OF DRAIN**	**SUBTOTAL**	**1145**	**1368**	**2650**
4100276	CITY OF ELKTON	UMPQUA RIVER		64481	
4100276	CITY OF ELKTON	UMPQUA RIVER			251660
4100276	**CITY OF ELKTON**	**SUBTOTAL**	**170**	**64481**	**251660**
4100279	CITY OF ESTACADA	CLACKAMAS RIVER (ESTACADA)		5714	
4100279	CITY OF ESTACADA	CLACKAMAS RIVER (ESTACADA)			341992
4100279	**CITY OF ESTACADA**	**SUBTOTAL**	**1910**	**5714**	**341992**
4100287	EUGENE WATER & ELECTRIC BOARD	MCKENZIE RIVER		25805	
4100287	EUGENE WATER & ELECTRIC BOARD	MCKENZIE RIVER			708818
4100287	**EUGENE WATER & ELECTRIC BOARD**	**SUBTOTAL**	**150,000**	**25805**	**708818**
4100297	FALLS CITY WATER DEPARTMENT	GLAZE CREEK		360	

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100297	FALLS CITY WATER DEPARTMENT	TEAL CREEK		186	
4100297	FALLS CITY WATER DEPARTMENT	GLAZE CREEK			288
4100297	FALLS CITY WATER DEPARTMENT	TEAL CREEK			2386
4100297	**FALLS CITY WATER DEPARTMENT**	**SUBTOTAL**	**1045**	**546**	**2674**
4100301	HECETA WATER DISTRICT	CLEAR LAKE			615
4100301	**HECETA WATER DISTRICT**	**SUBTOTAL**	**4500**		**615**
4100302	SILTCOOS HEIGHTS	SILTCOOS LAKE		825	
4100302	SILTCOOS HEIGHTS	SILTCOOS LAKE			38863
4100302	**SILTCOOS HEIGHTS**	**SUBTOTAL**	**125**	**825**	**38863**
4100317	CITY OF GATES	NORTH SANTIAM RIVER		2624	
4100317	CITY OF GATES	NORTH SANTIAM RIVER			238707
4100317	**CITY OF GATES**	**SUBTOTAL**	**535**	**2624**	**238707**
4100323	CITY OF GLENDALE	COW CREEK		37197	
4100323	CITY OF GLENDALE	MILL CREEK		42	
4100323	CITY OF GLENDALE	SECTION CREEK		426	
4100323	CITY OF GLENDALE	COW CREEK			80664
4100323	CITY OF GLENDALE	MILL CREEK			429
4100323	CITY OF GLENDALE	SECTION CREEK			575
4100323	**CITY OF GLENDALE**	**SUBTOTAL**		**37665**	**81669**
4100324	KERNVILLE-GLENEDEN-LINCOLN BCH W D	DRIFT CREEK		1861	
4100324	KERNVILLE-GLENEDEN-LINCOLN BCH W D	DRIFT CREEK			20376
4100324	**KERNVILLE-GLENEDEN-LINCOLN BCH W D**	**SUBTOTAL**		**1861**	**20376**
4100326	GLIDE WATER ASSOCIATION	NORTH UMPQUA RIVER		60943	
4100326	GLIDE WATER ASSOCIATION	NORTH UMPQUA RIVER			367586
4100326	**GLIDE WATER ASSOCIATION**	**SUBTOTAL**	**900**	**60943**	**367586**
4100333	CITY OF GOLD HILL	ROGUE RIVER		34045	
4100333	CITY OF GOLD HILL	ROGUE RIVER			249777
4100333	**CITY OF GOLD HILL**	**SUBTOTAL**	**1,115**	**34045**	**249777**

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100342	CITY OF GRANTS PASS	ROGUE RIVER		69042	
4100342	CITY OF GRANTS PASS	ROGUE RIVER			101888
4100342	**CITY OF GRANTS PASS**	**SUBTOTAL**	**26,000**	**69042**	**101888**
4100359	CORBETT WATER DISTRICT	NORTH FORK GORDON CREEK		324	
4100359	CORBETT WATER DISTRICT	SOUTH FORK GORDON CREEK		46	
4100359	CORBETT WATER DISTRICT	NORTH FORK GORDON CREEK			1773
4100359	CORBETT WATER DISTRICT	SOUTH FORK GORDON CREEK			1761
4100359	**CORBETT WATER DISTRICT**	**SUBTOTAL**	**2910**	**370**	**3534**
4100379	HILLSBORO-FOREST GROVE-BEAVERTON	NORTH FORK TRASK RIVER (BARNEY RESERVOIR)		600	
4100379	HILLSBORO-FOREST GROVE-BEAVERTON	TUALATIN RIVER		2817	
4100379	HILLSBORO-FOREST GROVE-BEAVERTON	NORTH FORK TRASK RIVER (BARNEY RESERVOIR)			4681
4100379	HILLSBORO-FOREST GROVE-BEAVERTON	TUALATIN RIVER			112489
4100379	**HILLSBORO-FOREST GROVE-BEAVERTON**	**SUBTOTAL**	**65100**	**3416**	**117170**
4100408	CITY OF JEFFERSON	NORTH SANTIAM RIVER		30953	
4100408	CITY OF JEFFERSON	NORTH SANTIAM RIVER			223196
4100408	**CITY OF JEFFERSON**	**SUBTOTAL**	**2245**	**30953**	**223196**
4100466	LANGLOIS WATER DISTRICT	FLORAS CREEK		3099	
4100466	LANGLOIS WATER DISTRICT	FLORAS CREEK			35926
4100466	**LANGLOIS WATER DISTRICT**	**SUBTOTAL**	**250**	**3099**	**35926**
4100473	CITY OF LEBANON	SOUTH SANTIAM CANAL		4508	
4100473	CITY OF LEBANON	SOUTH SANTIAM CANAL			73732
4100473	**CITY OF LEBANON**	**SUBTOTAL**	**11000**	**4508**	**73732**

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100483	LINCOLN CITY WATER DISTRICT	SCHOONER CREEK		310	
4100483	LINCOLN CITY WATER DISTRICT	SCHOONER CREEK			9284
4100483	**LINCOLN CITY WATER DISTRICT**	**SUBTOTAL**	**13527**	**310**	**9284**
4100493	LYONS MEHAMA WATER DISTRICT	NORTH SANTIAM RIVER		15262	
4100493	LYONS MEHAMA WATER DISTRICT	NORTH SANTIAM RIVER			73059
4100493	**LYONS MEHAMA WATER DISTRICT**	**SUBTOTAL**	**1670**	**15262**	**73059**
4100497	MCMINNVILLE WATER AND LIGHT	HASKINS RESERVOIR		691	
4100497	MCMINNVILLE WATER AND LIGHT	MCGUIRE RESERVOIR		20	
4100497	MCMINNVILLE WATER AND LIGHT	HASKINS RESERVOIR			1235
4100497	MCMINNVILLE WATER AND LIGHT	MCGUIRE RESERVOIR			4259
4100497	**MCMINNVILLE WATER AND LIGHT**	**SUBTOTAL**	**2100**	**711**	**5494**
4100513	MEDFORD WATER COMMISSION	ROGUE RIVER		69729	
4100513	MEDFORD WATER COMMISSION	ROGUE RIVER			231481
4100513	**MEDFORD WATER COMMISSION**	**SUBTOTAL**	**83,454**	**69729**	**231481**
4100520	MILL CITY WATER DEPARTMENT	NORTH SANTIAM RIVER		1594	
4100520	MILL CITY WATER DEPARTMENT	NORTH SANTIAM RIVER			17810
4100520	MILL CITY WATER DEPARTMENT	SUBTOTAL	1800	1594	17810
4100534	CITY OF MOLALLA	MOLALLA RIVER		43125	
4100534	CITY OF MOLALLA	MOLALLA RIVER			86867
4100534	**CITY OF MOLALLA**	**SUBTOTAL**	**3100**	**43125**	**86867**
4100548	CLARKS BRANCH WTR. ASSOCIATION	SOUTH UMPQUA RIVER		31450	
4100548	CLARKS BRANCH WTR. ASSOCIATION	SOUTH UMPQUA RIVER			52653
4100548	**CLARKS BRANCH WTR. ASSOCIATION**	**SUBTOTAL**	**140**	**31450**	**52653**

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100549	TRI-CITY WATER DISTRICT	SOUTH UMPQUA RIVER		36492	
4100549	TRI-CITY WATER DISTRICT	SOUTH UMPQUA RIVER			70005
4100549	**TRI-CITY WATER DISTRICT**	**SUBTOTAL**	**3500**	**36492**	**70005**
4100550	CITY OF MYRTLE CREEK	SOUTH UMPQUA RIVER		424	
4100550	CITY OF MYRTLE CREEK	SPRINGBROOK SPRINGS A		100	
4100550	CITY OF MYRTLE CREEK	SPRINGBROOK SPRINGS B		67	
4100550	CITY OF MYRTLE CREEK	SOUTH UMPQUA RIVER			3804
4100550	CITY OF MYRTLE CREEK	SPRINGBROOK SPRINGS A			187
4100550	CITY OF MYRTLE CREEK	SPRINGBROOK SPRINGS B			228
4100550	**CITY OF MYRTLE CREEK**	**SUBTOTAL**	**3,460**	**591**	**4219**
4100551	CITY OF MYRTLE POINT	NORTH FORK COQUILLE RIVER		81975	
4100551	CITY OF MYRTLE POINT	NORTH FORK COQUILLE RIVER			98932
4100551	**CITY OF MYRTLE POINT**	**SUBTOTAL**	**2715**	**81975**	**98932**
4100581	CITY OF OAKLAND	CALAPOOYA CREEK		5056	
4100581	CITY OF OAKLAND	CALAPOOYA CREEK			59857
4100581	**CITY OF OAKLAND**	**SUBTOTAL**	**954**	**5056**	**59857**
4100603	PANTHER CREEK WATER DISTRICT	PANTHER CREEK		35	
4100603	PANTHER CREEK WATER DISTRICT	PANTHER CREEK			1071
4100603	**PANTHER CREEK WATER DISTRICT**	**SUBTOTAL**	**550**	**35**	**1071**
4100624	CITY OF PHILOMATH PUBLIC WORKS	MARY'S RIVER		1084	
4100624	CITY OF PHILOMATH PUBLIC WORKS	MARY'S RIVER			84926
4100624	**CITY OF PHILOMATH PUBLIC WORKS**	**SUBTOTAL**	**4000**	**1084**	**84926**

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100657	PORTLAND BUREAU OF WATER WORKS	BULL RUN		60	
4100657	PORTLAND BUREAU OF WATER WORKS	BULL RUN			65523
4100657	**PORTLAND BUREAU OF WATER WORKS**	**SUBTOTAL**	**831000**	**60**	**65523**
4100672	CITY OF POWERS	BINGHAM CREEK		16	
4100672	CITY OF POWERS	SOUTH FORK COQUILLE RIVER		234	
4100672	CITY OF POWERS	BINGHAM CREEK			163
4100672	CITY OF POWERS	SOUTH FORK COQUILLE RIVER			93877
4100672	**CITY OF POWERS**	**SUBTOTAL**	**700**	**250**	**94039**
4100706	CITY OF RIDDLE	COW CREEK		83338	
4100706	CITY OF RIDDLE	COW CREEK			109130
4100706	**CITY OF RIDDLE**	**SUBTOTAL**	**1,303**	**83338**	**109130**
4100707	LAWSON ACRES WATER ASSOCIATION	COW CREEK		2363	
4100707	LAWSON ACRES WATER ASSOCIATION	COW CREEK			4661
4100707	**LAWSON ACRES WATER ASSOCIATION**	**SUBTOTAL**	**75**	**2363**	**4661**
4100712	CITY OF ROGUE RIVER	ROGUE RIVER		25273	
4100712	CITY OF ROGUE RIVER	ROGUE RIVER			43689
4100712	CITY OF ROGUE RIVER	SUBTOTAL	2000	25273	43689
4100717	ROBERTS CREEK WATER DISTRICT	SOUTH UMPQUA RIVER			3095
4100717	**ROBERTS CREEK WATER DISTRICT**	**SUBTOTAL**	**6500**	**0**	**3095**
4100719	UMPQUA BASIN WATER ASSOCIATION	NORTH UMPQUA RIVER		1214	
4100719	UMPQUA BASIN WATER ASSOCIATION	NORTH UMPQUA RIVER			32269
4100719	**UMPQUA BASIN WATER ASSOCIATION**	**SUBTOTAL**	**8500**	**1214**	**32269**
4100720	CITY OF ROSEBURG-WINCHESTER	NORTH UMPQUA RIVER		24682	
4100720	CITY OF ROSEBURG-WINCHESTER	NORTH UMPQUA RIVER			106472
4100720	**CITY OF ROSEBURG-WINCHESTER**	**SUBTOTAL**	**30000**	**24682**	**106472**

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100731	SALEM PUBLIC WORKS	NORTH SANTIAM RIVER AND IG		934	
4100731	SALEM PUBLIC WORKS	NORTH SANTIAM RIVER AND IG			16221
4100731	**SALEM PUBLIC WORKS**	**SUBTOTAL**	**170000**	**934**	**16221**
4100789	CITY OF SANDY	ALDER CREEK		633	
4100789	CITY OF SANDY	ALDER CREEK			3769
4100789	**CITY OF SANDY**	**SUBTOTAL**	**5030**	**633**	**3769**
4100792	CITY OF SCAPPOOSE	GOURLAY		550	
4100792	CITY OF SCAPPOOSE	LAZY CREEK		377	
4100792	CITY OF SCAPPOOSE	SOUTH FORK SCAPPOOSE CREEK		1477	
4100792	CITY OF SCAPPOOSE	GOURLAY			879
4100792	CITY OF SCAPPOOSE	LAZY CREEK			337
4100792	CITY OF SCAPPOOSE	SOUTH FORK SCAPPOOSE CREEK			2413
4100792	**CITY OF SCAPPOOSE**	**SUBTOTAL**	**3500**	**2404**	**3629**
4100808	COUNTRY VIEW MH ESTATES	ROGUE RIVER		94370	
4100808	COUNTRY VIEW MH ESTATES	ROGUE RIVER			639475
4100808	**COUNTRY VIEW MH ESTATES**	**SUBTOTAL**	**112**	**94370**	**639475**
4100811	CITY OF SHERIDAN	SOUTH YAMHILL RIVER		14950	
4100811	CITY OF SHERIDAN	SOUTH YAMHILL RIVER			120465
4100811	**CITY OF SHERIDAN**	**SUBTOTAL**	**5200**	**14950**	**120465**
4100821	CITY OF SILETZ	SILETZ RIVER		13670	
4100821	CITY OF SILETZ	TANGERMAN CREEK		1	
4100821	CITY OF SILETZ	SILETZ RIVER			117918
4100821	CITY OF SILETZ	TANGERMAN CREEK			296
4100821	**CITY OF SILETZ**	**SUBTOTAL**	**1100**	**13671**	**118214**
4100823	CITY OF SILVERTON	ABIQUA CREEK		1776	
4100823	CITY OF SILVERTON	ABIQUA CREEK			29894
4100823	**CITY OF SILVERTON**	**SUBTOTAL**	**5480**	**1776**	**29894**
4100843	STAYTON WATER SUPPLY	NORTH SANTIAM RIVER		0	

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100843	STAYTON WATER SUPPLY	NORTH SANTIAM RIVER			4537
4100843	**STAYTON WATER SUPPLY**	**SUBTOTAL**	**5630**	**0**	**4537**
4100847	CITY OF SUTHERLIN	CALAPOOYA CREEK NON-PAREIL		5055	
4100847	CITY OF SUTHERLIN	COOPER CREEK		480	
4100847	CITY OF SUTHERLIN	CALAPOOYA CREEK NON-PAREIL			49629
4100847	CITY OF SUTHERLIN	COOPER CREEK			2456
4100847	**CITY OF SUTHERLIN**	**SUBTOTAL**	**6360**	**5535**	**52086**
4100851	CITY OF SWEET HOME	SOUTH SANTIAM RIVER		31600	
4100851	CITY OF SWEET HOME	SOUTH SANTIAM RIVER			329872
4100851	**CITY OF SWEET HOME**	**SUBTOTAL**	**7235**	**31600**	**329872**
4100926	CITY OF WALDPORT	ECKMAN CREEK		40	
4100926	CITY OF WALDPORT	NORTH FORK WEIST CREEK		29	
4100926	CITY OF WALDPORT	ECKMAN CREEK			2756
4100926	CITY OF WALDPORT	NORTH FORK WEIST CREEK			169
4100926	CITY OF WALDPORT	SOUTH FORK WEIST CREEK			193
4100926	CITY OF WALDPORT	SUBTOTAL	3000	69	3118
4100953	CITY OF WILLAMINA WATER DEPARTMENT	WILLAMINA CREEK		15010	
4100953	CITY OF WILLAMINA WATER DEPARTMENT	WILLAMINA CREEK			37480
4100953	CITY OF WILLAMINA WATER DEPARTMENT	SUBTOTAL	1760	15010	37480
4100957	WINSTON-DILLARD WATER DISTRICT	SOUTH UMPQUA RIVER		28316	
4100957	WINSTON-DILLARD WATER DISTRICT	SOUTH UMPQUA RIVER			83243
4100957	WINSTON-DILLARD WATER DISTRICT	SUBTOTAL	6500	28316	83243
4100958	CITY OF YONCALLA	ADAMS CREEK		494	
4100958	CITY OF YONCALLA	ADAMS CREEK			709
4100958	CITY OF YONCALLA	WILSON CREEK			474
4100958	CITY OF YONCALLA	SUBTOTAL	1095	494	1183

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100968	CITY OF YAMHILL	TURNER CREEK		963	
PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4100968	CITY OF YAMHILL	TURNER CREEK			1955
4100968	CITY OF YAMHILL	SUBTOTAL	1500	963	1955
4100971	CITY OF CAVE JUNCTION	EAST FORK ILLINOIS RIVER		15476	
4100971	CITY OF CAVE JUNCTION	EAST FORK ILLINOIS RIVER			107511
4100971	CITY OF CAVE JUNCTION	SUBTOTAL	1,440	15476	107511
4100985	HILLSBORO-CHERRY GROVE	TUALATIN RIVER		952	
4100985	HILLSBORO-CHERRY GROVE	TUALATIN RIVER			14613
4100985	HILLSBORO-CHERRY GROVE	SUBTOTAL	250	952	14613
4101092	USFS TILLER RANGER STATION	USFS TILLER RANGER STATION		10566	
4101092	USFS TILLER RANGER STATION	USFS TILLER RANGER STATION			277963
4101092	USFS TILLER RANGER STATION	SUBTOTAL	1092	10566	277963
4101095	USFS WOLF CREEK JOB CORPS	LITTLE RIVER		2405	
4101095	USFS WOLF CREEK JOB CORPS	LITTLE RIVER			55405
4101095	USFS WOLF CREEK JOB CORPS	SUBTOTAL	250	2405	55405
4101174	BUELL-RED PRAIRIE WATER ASSN	GOOSENECK CREEK		959	
4101174	BUELL-RED PRAIRIE WATER ASSN	GOOSENECK CREEK			98
4101174	BUELL-RED PRAIRIE WATER ASSN	SUBTOTAL	980	959	98
4190416	FORT JAMES OPERATING CO.	COLUMBIA RIVER		819	
4190416	FORT JAMES OPERATING CO.	COLUMBIA RIVER			86153

PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4190416	FORT JAMES OPERATING CO.	SUBTOTAL	750	819	86153
4192139	TILLER ELEMENTARY, SD #15	SOUTH UMPQUA RIVER		386	
4192139	TILLER ELEMENTARY, SD #15	SOUTH UMPQUA RIVER			54592
4192139	TILLER ELEMENTARY, SD #15	SUBTOTAL	60	386	54592
PWS_ID[1]	PWS NAME	SOURCE	POPULATION SERVED	BLM ACRES	OTHER ACRES
4192152	POPE & TALBOT, INC.,	WILLAMETTE RIVER		77011	
4192152	POPE & TALBOT, INC.,	WILLAMETTE RIVER			1167276
4192152	POPE & TALBOT, INC.,	SUBTOTAL	800	77011	1167276
4192674	USFS STAR RANGER STATION	APPLEGATE RIVER		4402	
4192674	USFS STAR RANGER STATION	APPLEGATE RIVER			115722
4192674	**USFS STAR RANGER STATION**	**SUBTOTAL**	**25**	**4402**	**115722**
4194300	ROSEBURG FOREST PROD-DILLARD	SOUTH UMPQUA RIVER		3823	
4194300	ROSEBURG FOREST PROD-DILLARD	SOUTH UMPQUA RIVER			25041
4194300	**ROSEBURG FOREST PROD-DILLARD**	**SUBTOTAL**	**2000**	**3823**	**25041**

1 Department of Environmental Quality Public Water System identification number for surface drinking water watersheds.

Best Management Practices

Introduction

This section defines the best management practices (i.e., methods and measures) that were developed for the needs of the lands within the western Oregon planning area to comply with the requirements of the Clean Water Act.

Purpose

Best management practices (BMPs) are required by the federal Clean Water Act to reduce nonpoint source pollution to the maximum extent practicable. BMPs are considered the primary mechanisms for achieving Oregon's water quality standards. Oregon's narrative criteria, which include numeric standards, are designed to protect designated beneficial uses (such as salmonid spawning and rearing, resident fish and aquatic life, domestic water supplies, and water-contact recreation).

BMPs are defined as methods, measures, or practices selected on the basis of site-specific conditions to ensure that water quality will be maintained at its highest practicable level. BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.2, EPA Water Quality Standards Regulation).

These BMPs are commonly employed practices used in a variety of situations to maintain or improve water quality. Selection of specific BMPs needed to meet the Clean Water Act are made by soil and water professionals during project-level analyses.

Organization and Use

The BMPs in this appendix are organized by the following management activities:

- roads and landings
- timber harvest activities
- silvicultural activities
- fire and fuels management
- surface source water for drinking water
- recreation
- grazing

- minerals exploration and development
- spill prevention and abatement
- restoration

The tables that follow this introduction identify the input variables, causal mechanisms, and water quality standards (referenced by the Oregon Administrative Rules number) that are associated with each BMP. Those BMPs that are necessary for typical situations have been included. When applied, BMPs are expected to prevent water quality degradation and to meet water quality standards.

Causal mechanisms help explain the outcomes or the process through which an outcome occurs.

Narrative criteria

For information about Oregon's water quality standards and narrative criteria, start at http://www.blm.gov/nstc/WaterLaws/oregon2.html.

Resource aspects of land management activities normally have many facets that require site-specific BMP design. Therefore, there may be some repetition of the BMPs between sections of the following tables as some BMPs stand alone while others are used in combination or reference another section in order to address the needs of individual management activities.

Management of locatable minerals is governed by regulations found in 43 CFR 3809. BMPs for locatable minerals include language from 43 CFR 3809 that requires operators to prevent unnecessary and undue degradation from mining operations.

Some BMPs that relate to instream activities involving removal/fill may coincidently be similar to applicable practices in DEQ water quality permits and 401 certifications. These BMPs are not specific permit requirements, but rather demonstrate the process by which nonpoint source pollution from instream activities would be controlled. Appropriate practices in this appendix could be selected by the permitting agencies and included in specific permits or 401 certifications.

Application of Best Management Practices

It is not intended that all of the BMPs listed will be selected for any specific management action. BMPs are selected and implemented as necessary and practical, based on site-specific conditions. BMPs at times require adjustment to meet project and soil conditions within differing climatic and physiographic regions. Specialists may consider baseline environmental conditions, type of activity, proximity to water, disturbance level, direct, indirect, and cumulative effects and timing. Therefore, BMPs may be modified in order to match effective BMP controls to the project design.

Oregon Administrative Rules

For the rules related to water quality standards, search at http://arcweb.sos.state.or.us/banners/rules.htm.

BMPs must be applied in a manner that is consistent with all Resource Management Plan objectives. The overall goal is not to adhere strictly to a particular set of BMPs, but to meet water quality objectives when implementing management actions. Describing non-point pollution causal mechanisms allows specialists to exercise discretion as to what will work best in a particular situation. While this Appendix does not provide an exhaustive list of BMPs, the included BMPs are believed to cover most project activity situations in the Plan area. Additional nonpoint source control measures may be identified during the interdisciplinary process when evaluating site-specific management actions.

43 CFR 3809

For the complete BLM regulation, search for 3809 at http://www.blm.gov/search or see http://www.blm.gov/nhp/news/regulatory/3730/3809.html.

BMPs will be adjusted as necessary with feedback from monitoring or other sources of information.

Review and update of this Appendix will be accomplished through plan maintenance.

Roads and Landings

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 271. Best management practices for roads and landings

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Location		
Locate roads on stable locations without sediment delivery potential to streams (e.g., ridge tops, stable benches or flats, and gentle-to-moderate side-slopes). And avoid headwalls, old slump benches, geologic bedding planes, seeps, and steep channel-adjacent side slopes.	• Coarse Sediment, Fine Sediment, and Organic Debris: Failures from roads built across unstable landforms that may slide into stream channels • Coarse and Fine Sediment: Alters channel form, which warms stream temperatures due to either increased widening or deepening (incising) channels becoming disconnected from the flood plain hyporheic zone	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Temp OAR 340-041-0028 • Turbidity OAR 340-041-0036
Locate new permanent roads outside of Riparian Management Areas, unless construction is under existing reciprocal road right-of-way agreements.	• Coarse and Fine Sediment: Surface erosion or ravel, due to lack of adequate vegetative cover, or nearness to stream channels that may deliver. • Temperature: Roads located adjacent to streams, causing opening in forest canopy that may reduce local stream shade.	• Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Locate temporary road construction outside of Riparian Management Areas. Do not locate temporary roads parallel to stream channels and avoid new stream crossings.	• Coarse and Fine Sediment: Surface erosion or ravel, due to lack of adequate vegetative cover, or nearness to stream channels that may deliver. • Temperature: Roads located adjacent to streams, causing opening in forest canopy that may reduce local stream shade.	• Temp OAR 340-041-0028 • Turbidity OAR 340-041-0036
Locate roads so as to lower cutbank heights and slope angles where ditchlines deliver run-off directly to stream channels.	Coarse and Fine Sediment: Erosion from exposed soils on cut banks	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Locate roads and landings outside of Jurisdictional Wetlands.	Coarse and Fine Sediment: Surface erosion or ravel, due to lack of adequate vegetative cover, or nearness to stream channels that may deliver	• Antidegradation OAR 340-04l-0004 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Locate new landings outside of Riparian Management Areas or at least 200 ft from waterbodies (whichever is greater) and avoid expanding existing landings in Riparian Management Areas when sediment delivery to stream channels could occur.	• Coarse Sediment, Fine Sediment, and Temperature: Surface erosion or ravel, due to lack of adequate vegetative cover or nearness to stream channels that may deliver • Temperature: Increase landing size or shape, causing opening in forest canopy that may reduce local stream shade	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Locate landings in areas with low risk for landslides.	Coarse Sediment, Fine Sediment, and Organic Debris: Failures from landings sited on unstable landforms that may slide into stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Locate excavated material disposal areas outside Riparian Management Areas, floodplains, and unstable areas that could transport sediment to waterbodies.	Coarse and Fine Sediment: Surface erosion or ravel, due to lack of adequate vegetative cover, or nearness to stream channels that may deliver	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
General Construction		
Design roads no wider than needed for the specific use.	Coarse and Fine Sediment: Surface erosion from wet weather, due to lack of adequate vegetative cover that may deliver to a stream channel	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Limit road and landing construction, reconstruction, or renovation activities to the dry season, generally from May into October. When conditions permit operations outside of the dry season, keep erosion control measures concurrent with ground disturbance to the extent that the affected area can be rapidly stormproofed if weather conditions deteriorate.	Coarse and Fine Sediment: Surface erosion from wet weather, due to lack of adequate vegetative cover that may deliver to a stream channel	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
End-haul excavated material to minimize side-casting of waste material if side slopes generally exceed 60 percent, or where side-cast material may enter waterbodies, wetlands, or floodplains.	Coarse Sediment, Fine Sediment, and Organic Debris: Fill run-out or failures from roads built across steep landforms that may slide into stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Conduct pioneer road construction to avoid the deposition of materials in waterbodies, floodplains, or wetlands.	Coarse and Fine Sediment: Pioneer road construction earthwork, with some downslope movement or drifting of unconsolidated soil medium towards waterbodies, floodplains, or wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use controlled blasting techniques.	Coarse and Fine Sediment: Blasting with radial movement of unconsolidated soil medium or rock fragments, towards waterbodies, floodplains, or wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use only soil and rock materials in permanent road fills. Build up fills by layering; compact between 85 and 95 percent maximum density. Provide for additional fill drainage (e.g. use geo-textile fabrics, etc.) in landslide prone areas.	Coarse Sediment, Fine Sediment, and Organic Debris: Failures from roads with inadequate fill construction, or without proper drainage, that may slide into stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use temporary sediment containment structures (e.g. silt fencing).	Coarse and Fine Sediment: New earthwork, lacking vegetative cover, that may erode and deliver to waterbodies, floodplains, or wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Surface roads if they would be subject to traffic during wet weather.	Coarse and Fine Sediment: Road tread erosion, increased by traffic, especially during wet weather on susceptible soil types, causing rilling or rutting, and delivery to a stream channel	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Stabilize bare soil from construction prior to fall rains.	Coarse and Fine Sediment: Vegetative and organic ground cover, decreasing soil detachment, transport and delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Seed and mulch cut and fill slopes, ditchlines, and waste disposal areas where soil will support seed growth upon construction completion.	Coarse and Fine Sediment: Vegetative and organic ground cover, decreasing soil detachment, transport and delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Clear channels/ditches above culverts prior to fall rains.	Coarse and Fine Sediment: Culvert inlets becoming plugged with floatable organic debris, resulting in water ponding against the road fill, and headcutting and loss of the fill at the crossing or diversion and/or gullying down the road ditchline and loss of the road fill at another site, with sediment delivery to waterbodies, floodplains, or wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Correct special drainage problems (e.g., high water table, seeps) that effect stability of road subgrade through the use of perforated drains, geotextiles, or drainage bays.	Coarse and Fine Sediment: Saturated fills or wet areas that could fail or erode and deliver sediment to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Conduct slope rounding on tops of cut slopes in clayey soils to reduce sloughing and surface ravel.	Coarse and Fine Sediment: Erosion from exposed soils on cut and fill slopes. Road tread erosion, increased by traffic, especially during wet weather on susceptible soil types, causing rilling or rutting, and delivery to a stream channel.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1)&(13) • Turbidity OAR 340-041-0036
Windrow slash at the base of newly constructed fill slopes to catch sediment.	Coarse and Fine Sediment: Erosion from exposed soils on cut and fill slopes. Road tread erosion, increased by traffic, especially during wet weather on susceptible soil types, causing rilling or rutting, and delivery to a stream channel.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1)&(13) • Turbidity OAR 340-041-0036
Surface Drainage		
Provide effective drainage away from the road surface in maintained ditches on crown and ditch roads.	Coarse and Fine Sediment: Effective road surface drainage to the forest floor, preventing sediment delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
In-slope low traffic volume roads where the road footprint or underlying soil formation is very rocky, not erodible or subject to failure.	Coarse and Fine Sediment: Effective road surface drainage to the forest floor, preventing sediment delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Out-slope low traffic volume roads to provide surface drainage on road gradients less than 8 percent, where an inside ditch is not planned.	Coarse and Fine Sediment: Effective road surface drainage to the forest floor, preventing sediment delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use rolling drainage dips and/or lead-off ditches as options in lieu of culverts for low traffic volume roads with less than 10 percent gradient or where blocking roads is a road management objective.	Coarse and Fine Sediment: Effective road surface drainage to the forest floor, preventing sediment delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Locate surface water drainage measures (water bars, rolling dips, etc.) where water might accumulate, or where there is an outside berm that prevents drainage from exiting the roadway. Install during the dry season.	Coarse and Fine Sediment: Effective surface drainage to the forest floor, preventing sediment delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Roll the grade in erodible and unstable soils to reduce surface water volume and velocities.	Coarse and Fine Sediment: Effective surface drainage to the forest floor, preventing sediment delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Divert road and landing runoff water away from headwalls or unstable areas adjacent to stream channels.	Coarse and Fine Sediment: Water volume concentration resulting in headwall saturation with possible failures to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Shape landings to spread surface water runoff to natural, well-vegetated, stable ground.	Coarse and Fine Sediment: Effective surface drainage to the forest floor, preventing sediment delivery to stream channels	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Prevent diversion of water from streams into road ditches.	Coarse and Fine Sediment: Concentrated water flow from streams causing ditch erosion, and sediment delivery to another stream channel. Dewatering of a stream channel with negative effects on fishes and aquatic life.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1)&(13) • Turbidity OAR 340-041-0036
For roads involving very erodible soils near streams: • Construct 75 feet lead-in ditch to catchbasins • Require rock armoring of lead-in ditch for through fills greater than 6 feet in height • Design catch basins in a manner that would settle out transported sediments. Maintain these basins.	Coarse and Fine Sediment: Concentrated water flow from roads and subsequent soil movement to streams	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1)&(13) • Turbidity OAR 340-041-0036
Cross Drains		
Locate cross drains at intervals sufficient to prevent water volume concentration and accelerated ditch erosion.	Coarse and Fine Sediment: Water volume concentration, resulting greater erosive energy, rilling and gullying road ditchlines and delivery to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Increase cross drain frequency through unstable areas.	Coarse and Fine Sediment: Water volume concentration, resulting in headwall saturation with possible failures to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Use cross drainage culverts that are a minimum of 18 inches in diameter.	Coarse and Fine Sediment: Cross drain restricted size that can plug with sediments and debris, causing water flow volume concentration in ditchlines resulting in gullying with materials delivered to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Construct cross drainage culverts or drainage dips immediately upgrade of stream crossings to prevent ditch sediment from entering the stream.	Coarse and Fine Sediment: Concentrated ditch flow from storm events or snowmelt, causing erosion of the ditchline or carrying sediment sloughed from the cutbank, that if left unchecked may deliver to a stream channel	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Site cross drains to exit on convex slopes and avoid discharge onto erodible and/or unstable ground, (such as headwalls, slumps, or block failure zones), or directly into stream channels. Provide a buffer or sediment basin between the cross drain outlet and waterbodies, floodplains, or wetlands.	Coarse and Fine Sediment: Water volume concentration, resulting in headwall saturation with possible failures to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Armor drainage dips.	Coarse and Fine Sediment: Effective surface drainage to the forest floor, preventing water volume concentration and sediment delivery to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Install downspout structures and/or energy dissipators (e.g., rock material) at cross drain outlets or drain dips where water is discharged onto loose material or erodible soils, fills, or steep slopes.	Coarse and Fine Sediment: Concentrated ditch flow from storm events or snowmelt, causing erosion of the ditchline or carrying sediment sloughed from the cutbank that if left unchecked, may deliver to a stream channel	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Extend all downspout structures to the toe of fill onto undisturbed ground.	Coarse and Fine Sediment: Convey surface water safely off fills, preventing erosion and sediment delivery to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Cut protruding "cannon" culverts at the fill surface, install downspout and/or energy dissipators on erodible fills.	Coarse and Fine Sediment: Convey surface water safely off fills, preventing erosion and sediment delivery to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Place protective rock at culvert entrance.	Coarse and Fine Sediment: Prevent scour or road fills causing sediment delivery to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use slotted risers, over-sized culverts or build catch basins.	Coarse and Fine Sediment: Culvert plugging causing road fill failure and slug injections of sediments to waterbodies, floodplains and wetlands	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Stream Crossings		
Install all crossings during the low flow period (generally June 15 to September 15).	Coarse and Fine Sediment: Sediment movement downstream during periods of low turbidities with possible effects on aquatic life	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Stream Crossings: Permanent Stream Crossings		
Size culverts, bridges, and other stream crossings for the 100-year flood event (including allowance for bed load and small floatable debris) without exceeding capacity or diversion. Match culvert width with active channel width.	Coarse Sediment, Fine Sediment, nd Organic Debris: Floodwaters exceeding pipe capacity, causing overtopping of pipe and fills, with ensuing headcutting and loss of road fill.	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Limit the number of new stream crossings.	Coarse and Fine Sediment: Sediment entry of road related run-off	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Construct the stream crossing approach at a right angle (or as near a right angle as possible) to the stream.	Coarse and Fine Sediment: Earthwork near waterbodies, floodplains and wetlands causing sediment delivery.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Locate culvert placement on a well defined, unobstructed, and straight reach of stream. Avoid locations that require a stream channel to be straightened beyond the length of a culvert.	Coarse and Fine Sediment: Earthwork near waterbodies, floodplains and wetlands causing sediment delivery.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Do not install culverts on fill material in ephemeral or intermittent channels.	Coarse and Fine Sediment: Floodwater piping or eroding unconsolidated road fill, causing failures with sediment delivery to waterbodies, floodplains and wetlands.	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Divert (e.g., coffer dam, pumping etc.) the stream around the work area. Maintain diversion until all instream work is completed. Pump seepage water that may escape the containment to off-stream filtration area.	Coarse and Fine Sediment: rosion at the instream construction site causing sediment movement downstream during periods of low turbidities with possible effects on aquatic life.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use containment and filtering techniques (e.g., bladder barriers, silt curtains etc.) if diversion is not possible. Place sediment controls along or immediately downstream of the instream work.	Coarse and Fine Sediment: Sediment movement downstream during periods of low turbidities with possible effects on aquatic life.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Limit activities of mechanized equipment to streambank areas or temporary platforms when installing or removing structures.	Coarse and Fine Sediment: Erosion at the instream construction site causing sediment movement downstream	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Countersink culvert below the streambed. Increase culvert diameters accordingly.	Coarse and Fine Sediment: Scour of streambed at culvert outlet, causing entrainment of sediment in flowing water and delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Use stream crossing protection (e.g., hardened crossing, fill armoring, grade dipping, etc.) where high debris loads are expected (such as debris torrent channels) to allow overflow without loss of the fill.	Coarse Sediment, Fine Sediment, and Organic Debris: Debris flows plugging culverts or removing road fills with high delivery of sediments and materials to waterbodies, floodplains and wetlands.	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Provide adequate stream bank protection using bioengineering techniques (e.g., rock and/or organic material) where bank erosion would occur.	Coarse and Fine Sediment: Stream scour of road fill, causing entrainment of sediment in flowing water and delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Provide structural erosion control measures (e.g., rip-rap, wing walls, etc.) on erosion-prone fills, inlets, and outlets.	Coarse and Fine Sediment: Scour of streambed at culvert outlet, causing entrainment of sediment in flowing water and delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Place energy dissipators (e.g., large rock) at the outlet of culverts on streams.	Coarse and Fine Sediment: Stream scour of road fill, causing entrainment of sediment in flowing water and delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Stabilize fill material over stream crossing structures immediately after construction has been completed, normally before October 15. Exposed soils would be seeded and mulched. Temporarily suspend activity if rain saturates soils to the extent that there is potential for movement of sediment from the road to the stream. Soils must be covered or temporarily stabilized during work suspension.	Coarse and Fine Sediment: Surface erosion with sediment delivery to waterbodies, floodplains and wetlands.	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Incorporate additional design criteria (e.g., rock blankets, buttressing, relief pipes higher in the fill, etc.) for deep fills to lesson the susceptibility of fill failures.	Coarse Sediment, Fine Sediment, and Organic Debris: Floodwaters exceeding pipe capacity, causing overtopping of pipe, possible piping through fills with possible collapse or overtopping, with ensuing headcutting, loss of road fill, and possible dam break flood scouring downstream reaches.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use slotted risers, trash racks, or over-sized culverts to prevent culvert plugging in areas of active debris movement.	Coarse Sediment, Fine Sediment, and Debris: Mobile debris and materials plugging culverts with overtopping and failure of the road fill, and possible dam break flood, scouring downstream reaches	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Install permanent stream crossing structures before heavy equipment moves beyond the crossing area. Where this is not feasible, install temporary crossings.	Coarse and Fine Sediment: Sediment movement downstream during periods of low turbidities with possible effects on aquatic life	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Stream Crossings: Temporary Stream Crossings for Roads and Skid Trails		
Design temporary structures to keep vehicles/equipment out of the stream.	Coarse Sediment, Fine Sediment, Oil, and Toxins: Vehicles wheel tracks breaking down banks, to access stream channel bottoms, driving through stream water column, disturbing fish habitat, with possible release of oil, and asbestos from brake linings and similar toxins.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 • Statewide Narrative Criteria Toxics OAR 340-041-0007 • Turbidity OAR 340-041-0036
Limit the number of new temporary crossings on a stream.	Coarse and Fine Sediment: Sediment movement downstream during periods of low turbidities with possible effects on aquatic life.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use washed river rock as backfill material or crushed rock over geo-textile fabric, as fill over temporary culverts.	Coarse and Fine Sediment: Higher than anticipated streamflows, washing over or through temporary road crossing.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use methods other than fill first, or use the least amount of fill possible to facilitate the temporary stream crossing structure if a non-fill structure is not possible.	Coarse and Fine Sediment: Higher than anticipated streamflows, washing over or through temporary road crossing.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
No driving of mechanized equipment in the stream channel to the area that is necessary for installation and removal operations. Work from bank or temporary platforms.	Coarse Sediment, Fine Sediment, Oil, and Toxins: Mechanized equipment working within the stream channel, disturbing fish habitat, causing turbidity, and possible release of oil, and similar toxins.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 • Statewide Narrative Criteria Toxics OAR 340-041-0007 • Turbidity OAR 340-041-0036
Limit the installation and removal of temporary crossing structures to only one time during the same year and within the prescribed work period where possible. Follow practices under the Closure/Decommissioning section for removing stream crossing drainage structures and reestablishing natural drainage configuration.	Coarse and Fine Sediment: Fall or winter streamflows washing over temporary road and high stream energies washing a portion or all of the crossing downstream.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Stream Crossings: Low-Water Ford Stream Crossings		
Use materials that would withstand 100-year flow events (e.g., concrete, well anchored concrete mats, etc.) on permanent crossings.	Coarse Sediment, Fine Sediment, and Toxins: High streamflow undermining or twisting structure, with possible channel shifts, and partial collapse or loss of structure.	• Statewide Narrative Criteria Toxics OAR 340-041-0007 • Turbidity OAR 340-041-0036
Harden approaches with non-erodible materials on permanent crossings. Provide relief drainage on approaches.	Coarse Sediment, Fine Sediment, and Toxins: Loose road surfacing, washing into the stream during storms.	Turbidity OAR 340-041-0036
Use washed rock/gravel in temporary crossings, where a non-fill structure is not possible.	Coarse and Fine Sediment: Higher than anticipated streamflows, washing over or through temporary road crossing.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Restrict access to temporary crossings.	Coarse Sediment, Fine Sediment, Oil, and Toxins: Vehicles driving through stream water column, disturbing fish habitat, with possible release of oil, and asbestos from brake linings and similar toxins.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 • Statewide Narrative Criteria Toxics OAR 340-041-0007 • Turbidity OAR 340-041-0036
Use ramped low water fords in debris flow susceptible streams.	Coarse and Fine Sediment: Debris flows piling against road fills, plugging culverts and overtopping and loss of road prism, or dam break flood wave scouring downstream habitat.	Turbidity OAR 340-041-0036
Road Use and Dust Abatement		
Apply durable rock surfacing to withstand expected loads and traffic volume.	Coarse and Fine Sediment: Road rock breaking down to fines, and washing from roads to ditchlines to stream channels.	Turbidity OAR 340-041-0036
Avoid wet season (generally, November through April) hauling on unsurfaced roads.	Coarse and Fine Sediment: Road surface becoming soft and eroding and washing from roads to ditchlines to stream channels.	Turbidity OAR 340-041-0036
Apply structural treatments (i.e., adjust frequency of cross-drain spacing, sediment barriers or catch basins, gravel lifts or asphalt road surfacing at stream crossing approaches, and clean and armor ditchlines) for winter hauling.	Coarse and Fine Sediment: Road ditchlines gaining water volume concentration, transporting soil material to stream channels, or sediment sources near channels that can flow overland during storms by sheetwash or rill erosion, depositing soil material into stream channels.	Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Suspend timber hauling during wet weather when road surface degradation results in sediment delivery to waterbodies, floodplains and wetlands. Hauling could resume when ditch flow subsides or turbidity standards are met.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
Suspend timber hauling during wet weather when road run-off delivers sediment at higher concentrations than the existing conditions in the receiving stream. Hauling could resume when ditch flow subsides, or when conditions allow turbidity standards to be met.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
Remove snow on haul roads in a manner that will protect roads and adjacent resources. Remove or place snow berms to prevent water concentration on the roadway or on erodible side-slopes or soils.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
Wash equipment at sites with no potential for run-off into waterbodies, floodplains, or wetlands.	Coarse and Fine Sediment: Soil erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
Use water or approved surface stabilizers/dust palliatives to reduce surfacing material loss and buildup of fine sediment that may wash off into waterbodies, floodplains, or wetlands.	Coarse and Fine Sediment: Road surfacing becoming detached and blowing or washing from roadways to ditchlines to stream channels.	Turbidity OAR 340-041-0036
Maintenance		
Avoid routine machine cleaning of ditches during the wet season (generally, November through April).	Coarse and Fine Sediment: Removing vegetation or fill material from ditches in the wet season would increase bare soils susceptible to erosion, with potential delivery to stream channels.	Turbidity OAR 340-041-0036
Avoid undercutting of cut-slopes when cleaning ditchlines. Seed and mulch bare soils.	Coarse and Fine Sediment: Removing vegetation or fill material from ditches or undercutting backslopes would increase bare soils susceptible to erosion, with potential delivery to stream channels.	Turbidity OAR 340-041-0036
Promptly remove slide material when it is obstructing road surface and ditchline drainage.	Coarse and Fine Sediment: Slide material, being eroded by ditch streamflow and routing to stream channels, especially during storms.	Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
End-haul sloughed or excavated materials to a stable site outside Riparian management areas with no potential to reach waterbodies, wetlands and floodplains. Avoid wasting loose ditch or surface material over the shoulder where it can cause stream sedimentation or weaken slump prone areas.	Coarse and Fine Sediment: Wasting soil material on steep slopes, may trigger a debris avalanche that could enter a stream channel, delivering sediment and debris.	• Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Turbidity OAR 340-041-0036
Keep road inlet and outlet ditches, catch basins, and culverts free of obstructions, particularly before and during winter precipitation and spring run-off.	Coarse and Fine Sediment: Plugged culverts by sediment and debris, leading to los of road fill and movement of road sediment downstream.	Turbidity OAR 340-041-0036
Repair damaged inlets and downspouts to maintain drainage design capacity.	Coarse and Fine Sediment: Plugged culverts by sediment and debris, leading to los of road fill and movement of road sediment downstream.	Turbidity OAR 340-041-0036
Blade and shape roads to conserve existing aggregate surface material, retain the original crowned or out-sloped self-draining cross section, prevent or remove eroding berms (except those designed for slope protection) and other irregularities that retard normal surface runoff.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
Eliminate undesirable berms that retard surface runoff.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
Retain low-growing, herbaceous ground cover and brush on cut-and-fill slopes and ditchlines during the wet season (generally, November through April).	Coarse and Fine Sediment: Increased vegetative cover rapidly diminishes surface erosion potential, and delivery of sediment to stream channels.	Turbidity OAR 340-041-0036
Cut roadside vegetation rather than pulling it out and disturbing the soil.	Coarse and Fine Sediment: Pulling vegetation near ditchlines, creates loose soil material that may fall or wash into ditchlines and then route to stream channels.	Turbidity OAR 340-041-0036
Closure and Decommissioning		
• Decommission new roads not included in the permanent road system upon completion of use, or stormproof if needed the following season. • Decommission older, under used roads that require high maintenance where regular maintenance is unlikely to occur due to lack of resources. • Decommission to Level 1 and any other appropriate level as described below.	Coarse and Fine Sediment: Surface erosion with delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Level 1: Gate or block roads not needed, but not recommended to be fully decommissioned.	Coarse and Fine Sediment: Wheel track formation and rilling/gullying with delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Level 2: Convert existing drainage structures such as ditches and cross drain culverts to a long-term no maintenance drainage configuration such as large dips, outsloped road surface, and well drained, high-capacity waterbars.	Coarse and Fine Sediment: Sediment accumulation or debris plugging cross drains causing road erosion.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Remove stream crossing culverts and in-channel fill material during low flow (generally, June 15 to September 15) and prior to fall rains. Pull back road fill to match channel widths and establish former drainageways when removing culverts.	Coarse and Fine Sediment: Sediment accumulation or debris plugging stream culverts, causing road gully erosion or stream crossing failure. Stream channels readjusting to active channel width, entraining road fill materials.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Place excavated material from removed stream crossings in a stable location where it would not reenter the stream. If necessary, place sediment and erosion controls around all stockpiled material.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Reestablish stream crossings to the natural stream gradient. Reestablish stream side slopes to the natural contour.	Coarse and Fine Sediment: Stream bed nickpoints traveling upstream, scouring below the armor layer in gravel bed streams causing excessive channel erosion. Surface erosion delivering to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Seed (with native or approved seed), mulch, and plant (with native tree species) streambanks and side slopes as soon as possible after culvert removal has been completed, and before October 15.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Place sediment trapping materials (such as straw bales) at the toe of the stream adjacent side slopes.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Waterbar decommissioned roads on each side of stream crossings.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Level 3: Seed and mulch the road surface, where erosion could occur.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Level 4: Till the roadbed, landings, and construction areas.	Coarse and Fine Sediment: Water concentration eroding compacted surfaces resulting to sediment delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Level 5: Pull back road fill and recontour to the natural slopes.	Coarse and Fine Sediment: Water concentration eroding compacted surfaces resulting to sediment delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Suspend decommissioning work if rain saturates soils to the extent that there is potential for environmental damage, including movement of sediment from the road to the stream.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Stormproof open roads not scheduled for planned maintenance.	Coarse and Fine Sediment: Surface erosion with delivery to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Place woody material or other appropriate barriers to discourage off-highway vehicle use on decommissioned roads, unless specifically designated for this use.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Water Source Development and Use		
Construct water sources during low flows (generally, August through October).	Coarse Sediment, Fine Sediment, and Aquatic Habitat: Changing or removing stream habitat and associated stream turbidity.	• Biocriteria OAR 340-041-0011 • Turbidity OAR 340-041-0036
Locate road approaches to in-stream water source developments so as to limit disturbance to vegetation. Surface these approaches with rock.	Coarse Sediment, Fine Sediment, and Toxins: Road surfacing, washing into the stream during storms.	Turbidity OAR 340-041-0036
Avoid use of road fills for water impoundment dams unless specifically designed for that purpose. Existing road fill impoundments are required to pass 100-year flood events without failure.	Coarse Sediment, Fine Sediment, and Toxins: Road fill washout, leading to stream sedimentation	• Biocriteria OAR 340-041-0011 • Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 • Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Direct overflow from off-channel water developments back into the stream as long as overflow water characteristics remain the same.	Low Flows: Decreasing low flows, potentially causing increased stream water temperatures, and decreased stream oxygen levels.	• Dissolved Oxygen OAR 340-041-0016 • Temperature OAR 340-041-0028

Best Management Practices for Roads and Landings	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Do not construct temporary pump chances. When necessary, use temporary plastic dams to create chances and remove these dams when not actively pumping.	Low Flows: Decreasing low flows, potentially causing increased stream water temperatures, and decreased stream oxygen levels.	• Dissolved Oxygen OAR 340-041-0016 • Temperature OAR 340-041-0028
Suspend pump intakes near the deepest/highest quantity of flow of the stream. Do not place pump intakes on the substrate or edges of the stream channel.	Coarse Sediment, Fine Sediment, and Stream Habitat: Changing or removing stream habitat and associated stream turbidity.	• Biocriteria OAR 340-041-0011 • Turbidity OAR 340-041-0036

Timber Harvest Activities

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 272. Best management practices for timber harvest activities

Best Management Practices for Timber Harvest Activities	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
	Cable Yarding	
Yard away from riparian management areas	• Coarse and Fine Sediment: Yarding operations can cause compaction, displacement and exposure of soils and sediment sources in zones with potential for transport and delivery of sediment to water bodies and wetlands resulting in turbidity. • Water Temperature: Yarding operations in RMA's can result in vegetation canopy loss due to removal for safety and operations. Decreases in canopy can result in losses of effective shade and exposure of stream channel to solar radiation, resulting in heating of the waterbody.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Remove introduced slash into waterbodies within before the next precipitation and runoff event.	Coarse and Fine Sediment: Debris jams can form damming the stream and directing streamflow against banks, leading to bank erosion , or a dam break flood.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036

Best Management Practices for Timber Harvest Activities	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Design yarding corridors so as to limit canopy loss in riparian management areas and to meet shade targets. Techniques include limiting the number of such corridors, using narrow widths, and using a perpendicular orientation to the stream.	Water Temperature: Yarding corridors in RMA's can result in vegetation canopy loss due to removal for safety and yarding operations. Decreases in canopy can result in losses of effective shade and exposure of stream channel to solar radiation, resulting in heating of the waterbody. Removal of more than 80% effective shade can exceed criteria and TMDL Targets	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Temperature OAR 340-041-0028
Require full suspension over flowing streams, non-flowing streams with erodible bed and bank, and jurisdictional wetlands.	Coarse and Fine Sediment: Log yarding through waterbodies can cause direct introduction of sediment into water or channels resulting in accumulation of sediment and turbidity. Displacement of stream and wetland bed and banks exposing soil to erosion resulting in sedimentation and turbidity.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036
Limit downhill logging into riparian management areas or where yarding trails can expand the stream or ditch network.	Coarse and Fine Sediment: Downhill logging into RMA's could result in converging skid paths intersecting stream channels, and less than full suspension, which could result in sediment accumulation, delivery and turbidity	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036
Widely space yarding corridors or new road crossings within riparian management areas if no practical alternative exists to treat adjacent uplands, or to avoid building more roads or landings.	Temperature and Sediment: Site specific acceptance of RMA entry can reduce overall displacement of soils and canopy losses in riparian areas, floodplains and wetlands. Cumulative increases in sediment and temperature can be reduced through tradeoffs with local site specific impacts.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Where slopes exceed 60 percent along stream channels, yard with full suspension, one-end suspension using seasonal restrictions, or one-end suspension using a standing skyline with lateral yarding capacity. Yard remaining areas using one-end suspension	Coarse and Fine Sediment: Slopes greater than 65% present a high risk of soil displacement and transport downslope to RMAs due to gravitational forces. Increased displacement from lack of log suspension can cause excessive displacement, exposure of sediment sources and delivery to waterbodies and wetlands.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036
Implement erosion control measures such as water-barring, slash placement and seeding in cable yarding corridors where the potential for erosion and delivery to waterbodies, floodplains and wetlands exists.	Coarse and Fine Sediment: Exposure of soils to erosive forces of water with potential delivery to waterbodies and wetlands.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036

Best Management Practices for Timber Harvest Activities	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Ground-Based Yarding		
Exclude ground-based yarding on hydric soils.	Coarse and Fine Sediment: Displacement and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036
When operating within riparian management areas: • Avoid construction of new skid trails by preferentially using existing skid trails. • In previously un-entered stands, use designated skid trails to limit soil compaction to no more than 12 percent of the harvest area. • Site-specific conditions, such as shade retention or soil erodibility, may require a ground-based equipment exclusion zone (50 to 75 feet) adjacent to waterbodies, floodplains, and wetlands to provide filtration and shade retention. • Limit width and attain one end suspension. • Restrict ground-based harvest and skidding operations to periods of low soil moisture when soils have the most resistance to compaction and displacement. • Use "one-pass" harvest techniques.	• Coarse and Fine Sediment: Displacement and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity • Temperature: Loss of vegetation canopy due to removal during yarding operations. Decreased shade and exposure of stream channel to solar radiation and increased heating.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Temperature OAR 340-041-002 • Turbidity OAR 340-041-0036
Limit mechanical track equipment to slopes less than 35 percent and nontrack mechanized equipment to slopes less than 20 percent.	Coarse and Fine Sediment: Displacement and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036

Best Management Practices for Timber Harvest Activities	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Designate skid trails where water from trail surface would not be channeled into unstable areas adjacent to waterbodies, floodplains, and wetlands.	Coarse and Fine Sediment: Compaction of skid trails resulting in additional surface flow to unstable areas. Increases in water to unstable areas can elevate pore pressure and weight of unstable area causing mass wasting and delivery of sediment and turbidity to waterbodies and wetlands.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036
Directionally fall trees towards skid trails.	Coarse and Fine Sediment: Minimize compaction of skid trails resulting in loss of infiltration, surface water flow and erosion of exposed soils. Potential delivery to waterbodies and wetlands resulting in sedimentation and turbidity.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036
Apply erosion control practices to all disturbed areas (eg., skid trails) with potential for erosion and delivery to waterbodies, floodplains, or wetlands. These practices could include tillage, water barring, seeding, mulching, and woody debris placement."	Coarse and Fine Sediment: Exposure of soils to erosive forces of water with potential delivery to waterbodies and wetlands.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036
Allow logging on snow when snow depth is greater than 18 inches or over frozen ground.	Coarse and Fine Sediment: Displacement, compaction, and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1)&(13) • Turbidity OAR 340-041-0036
Block skid roads that intersect haul roads at the end of seasonal use.	Coarse and Fine Sediment: Displacement, compaction, and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1)&(13) • Turbidity OAR 340-041-0036

Best Management Practices for Timber Harvest Activities	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Helicopter		
Use helicopter yarding in waterbodies, floodplains, and wetlands when other BMP's will not meet water quality standards/ criteria.	• Coarse and Fine Sediment: Soil exposure due to yarding operations resulting in soil erosion with potential transport to the waterbody resulting in sedimentation and turbidity. • Temperature: Loss of vegetation canopy due to removal during yarding operations. Decreased shade and exposure of stream channel to solar radiation and increased heating.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Horse		
Limit horse logging in riparian management area's to slopes less than 20 percent.	Coarse and Fine Sediment: Soil on skid trails exposed to water erosion with potential delivery to waterbodies , floodplains, and wetlands resulting in sedimentation and turbidity.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036
Construct waterbars on horse skid trails when there is potential for soil erosion and delivery to waterbodies, floodplains, and wetlands.	Coarse and Fine Sediment: Soil on skid trails exposed to water erosion with potential delivery to waterbodies , floodplains, and wetlands resulting in sedimentation and turbidity.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Turbidity OAR 340-041-0036

Silvicultural Activities

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 273. Best management practices for silvicultural activities

Best Management Practices for Silvicultural Activities	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
General		
During active silvicultural management of riparian management areas, retain dominant site potential species within primary shade zones.	Temperature: Persistent stream canopy provides consistent effective shade over time and will contribute to meeting shade targets and temperature criteria.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Temperature OAR 340-041-0028
Limit crossing stream channels with motorized support vehicles (e.g., ATV's) and mechanized equipment to existing road crossings.	Coarse and Fine Sediment: Vehicle and equipment crossing streams can cause breakdown of bed and banks exposing soil to water erosion and resulting turbidity.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Thinning		
Fell thinned trees away from steams when possible.	Coarse and Fine Sediment: Accumulation of slash in channels can redirect flows out of the stream channel, increasing stress on banks and resulting in streambank and floodplain erosion and increases in local turbidity	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Use manual techniques (includes chainsaws) for thinning within riparian management areas.	Coarse and Fine Sediment: Avoiding soil exposure from the use of ground based equipment, and the possible erosion and delivery of sediment to waterbodies and wetlands resulting in turbidity increases.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Retain as much down, woody material in riparian management areas as possible.	Coarse and Fine Sediment: RMA's function as filtration barriers to fine sediment if the soil surface and organic material is retained on the soil surface.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Remove excess slash from steep headwalls (e.g., gross yard). Embedded logs or other logs that contribute to channel or slope stability will not be removed.	Coarse and Fine Sediment: Accumulation of slash in unstable areas associated with channels can over weight slope surface causing translational sliding and debris torrents , delivering sediment and resulting in downstream turbidity.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036

Best Management Practices for Silvicultural Activities	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Scatter treatment debris on disturbed soils and water bar any yarding trails that could erode and deposit in water bodies , floodplains, and wetlands	Coarse and Fine Sediment: Erosion of exposed soil and delivery to waterbodies and wetlands resulting in turbidity increases.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Fertilization		
Avoid applying fertilizer to riparian management areas, floodplains, and wetlands.	Nutrient Enrichment: Application of Nitrate to potentially nitrogen rich riparian areas, leading to leaching and delivery of nitrates through local groundwater to and water bodies.	• 0.5 mg/L toxic to rainbow trout • Biocriteria OAR 340-041-0011
Locate storage, transfer, and loading sites outside riparian management areas and away from streams and road ditches that are linked to stream channels.	Nutrient Enrichment: Spilling of fertilizer with potential delivery of nutrients to waterbodies and wetlands through leaching or direct surface water transport.	• 0.5 mg/L toxic to rainbow trout • Biocriteria OAR 340-041-0011
Apply fertilizer when climate conditions (wind and rain) minimize risk of application to water bodies, floodplains, and wetlands.	Nutrient Enrichment: Application of Nitrate to potentially nitrogen rich riparian areas, leading to leaching and delivery of nitrates through local groundwater to and water bodies.	• 0.5 mg/L toxic to rainbow trout • Biocriteria OAR 340-041-0011
Stand Conversion		
Klamath Falls: • Use mechanical treatments in aspen stands during the dry season (generally, May through September). • Where slopes along streams are less than 30%, limit mechanical equipment to 25 feet from the edge of the riparian zone. • Where slopes along streams are greater than 30%, limit mechanical equipment to 50 feet from the edge of the riparian zone. • Limit mechanical entry to within 50 feet from the edge of wetlands riparian indicators.	Coarse and Fine Sediment: Displacement and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036

Fire and Fuels Management

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 274. Best management practices for fire and fuels management

Best Management Practices for Fire and Fuels Management	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Fuels Management		
Fuels Management: Underburn, Concentration Burn, and Broadcast Burn		
• Allow low intensity underburns to back into riparian management areas; however no ignition would occur within riparian management areas, unless prescribed for restoration purposes. • Keep concentration and broadcast burns at least 100 feet away from riparian management areas, unless prescribed for restoration purposes. • Locate ignition lines above large open meadows associated with stream channels.	Coarse Sediment, Fine Sediment, and Temperature: • Bare soil in RMA is subject to surface erosion and potential sediment delivery to adjacent waterbody. • Loss of riparian vegetation due to wildfire could reduce shade and increase water temperature.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Avoid ignition of large woody material that is touching the high water mark of a waterbody or that may be affected by high flows.	Coarse and Fine Sediment: Large wood provides channel stabilization and energy dissipation, thus reducing channel erosion and subsequent sedimentation.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
• Avoid delivery of foam or additives to waterbodies, floodplains, or wetlands. • Store and dispose of ignition devices/materials (e.g., flares, plastic spheres, etc.) outside riparian management areas or a minimum of 100 feet from waterbodies, floodplains, and wetlands. • Maintain and refuel equipment (e.g., drip torches, chainsaws, and portable pumps) a minimum of 100 feet from waterbodies, floodplains, and wetlands.	Chemicals: Direct contamination of waterbodies.	Toxic Substances OAR 340-041-0033

Best Management Practices for Fire and Fuels Management	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
• Limit hand constructed firelines inside riparian management areas and prohibit machine constructed firelines in riparian management areas. • Construct firelines by hand on all slopes greater than 35 percent. • Use erosion control techniques such as tilling, waterbaring, or debris placement on firelines. Construct waterbars on tractor and hand firelines. • Avoid placement of any fireline where water would be directed into waterbodies, floodplains, wetlands, headwalls, or areas of instability.	Coarse and Fine Sediment: Firelines can channel water and sediment into waterbodies.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Fuels Management: Pile and Burn		
• Prohibit mechanical piling within riparian management areas. • Prohibit tractor piling in areas that could deliver sediment to waterbodies, floodplains, wetlands.	Coarse and Fine Sediment: Ground disturbance reduces infiltration and increases surface runoff with subsequent soil movement. Erosion more likely on steeper slopes.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Use temporary stream crossings if necessary for equipment to access the opposite side. Follow Temporary Stream Crossing practices under Roads section.	Coarse and Fine Sediment: Equipment can damage streambeds and banks causing turbidity and sedimentation.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Locate hand piles outside riparian management areas for fish-bearing or perennial streams, and springs/ seeps/wetlands, unless prescribed for restoration purposes.	Coarse Sediment, Fine Sediment, and Temperature: • Bare soil is subject to surface erosion. • Loss of riparian vegetation due to fire could reduce shade and increase water temperature.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036

Best Management Practices for Fire and Fuels Management	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Locate hand piles outside of riparian management areas for intermittent streams or above the first slope break, whichever is greater, unless prescribed for restoration purposes.	Bare soil is subject to surface erosion.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Fuels Management: Mechanical and Manual Fuel Treatments		
• No mechanical fuel reduction equipment within 75 feet of streams and other waterbodies, unless prescribed to meet specific land management objectives. • Limit mechanical fuel reduction equipment to slopes less than 35 percent. Restrict non-track mechanized equipment to slopes less than 20 percent.	Ground-based equipment reduces infiltration and increases surface runoff with subsequent soil movement.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Use temporary stream crossings if necessary to access the opposite side with any equipment or vehicles (including ATVs). Follow Temporary Stream Crossing practices under Roads section.	Coarse and Fine Sediment: Stream crossings subject to streambank damage and erosion.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Place residual slash on disturbed areas and seed upon completion when appropriate.	Coarse and Fine Sediment: Bare soil areas are subject to erosion and subsequent sediment delivery to waterbody.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Maintain and refuel equipment (e.g., drip torches, chainsaws, and portable pumps) at least 100 feet from waterbodies, floodplains, and wetlands.	Petroleum Products: Direct contamination of waterbodies.	Toxic Substances OAR 340-041-0033
Wildfire		
Wildfire: Suppression		

Best Management Practices for Fire and Fuels Management	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
• Limit hand constructed firelines and prohibit machine constructed firelines inside riparian management areas. • Where hand constructed firelines are necessary in riparian management areas, angle the approach rather than have it perpendicular to the riparian management area. • Exclude ground-based equipment within riparian management areas. Limit use of heavy equipment adjacent to riparian management areas and on slopes greater than 35 percent.	Coarse and Fine Sediment: Ground-based equipment reduces infiltration and increases surface runoff with subsequent soil movement. Soil disturbance causes soil erosion and potential for soil movement to waterbody.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
• Prevent cutting of logs or woody material if any portion of that material extends into the stream channel. • Fall snags in the riparian management area towards the stream channel when felling is necessary for safety or fire suppression activities.	Coarse and Fine Sediment: Large wood stabilizes channels and prevents channel erosion.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Do not locate incident bases, camps (including spike/remote camps), helibases, staging areas, constructed helispots, and other centers for incident activities in riparian management areas or within 200 feet of any waterbody, floodplain, or wetland.	Coarse Sediment, Fine Sediment, Temperature, and Petroleum Products: Riparian disturbance from equipment and people could increase sediment. Removal of riparian vegetation could cause water temperature increases. Accidental spillage of fuel and other chemicals could enter waterways.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) • Temperature OAR 340-041-0028 • Toxic Substances OAR 340-041-0033 • Turbidity OAR 340-041-0036
Locate and maintain portable sanitation facilities at incident bases, camps (including spike/remote camps), helibases, staging areas, constructed helispots, and other centers for incident activities in accordance with state and local regulations.	Bacteria: Contamination from human waste.	Bacteria OAR 340-041-0009
• Keep chemical retardant, foam, or additives out of waterbodies, floodplains, or wetlands. • Do not use chemical retardants within the riparian management area. • Apply aerial retardant adjacent to riparian management areas by making parallel passes.	Chemical Retardants: Contamination of waterbodies from chemical retardant.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) • Toxic Substances OAR 340-041-0033

Best Management Practices for Fire and Fuels Management	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Wildfire: Rehabilitation		
Implement emergency fire rehabilitation treatments to accomplish erosion control as quickly as possible and before the wet season. Examples include: • Use native or other ecologically appropriate vegetation for short-term cover development and long-term recovery. • Mulch with straw or other suitable material. • Use straw wattles. • Install log erosion barriers. • Spread slash on bare soils. • Place channel stabilization structures. • Place sediment retention structures in channel. • Place trash racks above road drainage structures. • Install drainage structures, such as water bars or drainage dips, on firelines, fire roads, and other cleared areas according to guidelines in *Table 5* (Waterbar spacing by gradient and erosion class). • Repair damaged road drainage facilities. • Block or decommission roads and trails.	Coarse and Fine Sediment: Bare soil areas are subject to erosion and subsequent sediment delivery to waterbody.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036

Best Management Practices for Fire and Fuels Management	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Wildfire: Fuel/Retardant Transport		
If more than 42 gallons of fuel or combined quantity of petroleum product and chemical substances would be transported to a project site, the following precautions would be implemented. 1. Plan a safe route and transfer sites that could contain the transported volume. 2. Plan an active dispatch system that can relay the information to appropriate resources. 3. Ensure a spill containment kit that can adsorb and contain 55 gallons of petroleum product and chemical substances is readily available. 4. Provide for immediate notification in the event of a spill. Have a radio equipped vehicle lead the chemical or fuel truck to the project site. 5. Assemble a spill notification list that includes the district hazardous materials coordinator, DEQ, and spill clean-up contractors. 6. Construct a water user contact list with address and phone numbers. 7. When operating within Source Water Watersheds, pre-estimate travel times through the watershed to predict downstream arrival times. 8. Be prepared to sample water and carry sample containers.	Petroleum and Chemical Substances: Spillage into waterbodies with chemical contamination of waterbodies.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033

Table 275. Waterbar spacing by gradient and erosion class

Gradient (%)	Waterbar Spacing (feet)[1] Per Erosion Class[2]		
	High Class	Moderate Class	Low Class
2 to 5%	200 ft.	300 ft.	400 ft.
6 to 10%	150 ft.	200 ft.	300 ft.
11 to 15%	100 ft.	150 ft.	200 ft.
16 to 20%	75 ft.	100 ft.	150 ft.
21 to 35%	50 ft.	75 ft.	100 ft.
36+%	50 ft.	50 ft.	50 ft.

[1]Spacing is determined by slope distance and is the maximum allowed for the grade.

[2]The erosion classes include the following rock types:

- **High:** granite, sandstone, andesite porphyry, glacial or alluvial deposits, soft matrix conglomerate, volcanic ash, and pyroclastics
- **Moderate**: basalt, andesite, quartzite, hard matrix conglomerate, and rhyolite
- **Low:** metasediments, metavolcanics, and hard shale

Surface Source Water for Drinking Water

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 276. Best management practices for surface source water for drinking water

Best Management Practices for Surface Source Water for Drinking Water	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Sanitary facilities would be planned, located, designed, constructed, operated, inspected, and maintained to minimize possibilities of water contamination.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	• Antidegradation OAR 340-041-0004(1) • Bacteria OAR 340-041-0009 • Statewide Narrative OAR 340-041-0007(1) and (13)
Locate contractor camps outside Oregon Department of Environmental Quality sensitive zones in surface source water watersheds. If this is not possible, require self-contained sanitary facilities.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	• Antidegradation OAR 340-041-0004(1) • Bacteria OAR 340-041-0009 • Statewide Narrative OAR 340-041-0007(1) and (13)
Require self-contained sanitary facilities in surface source water watersheds, when long-term camping (greater than 14 days) is involved with contract implementation.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	• Antidegradation OAR 340-041-0004(1) • Bacteria OAR 340-041-0009 • Statewide Narrative OAR 340-041-0007(1) and (13)
Provide self-contained sanitary facilities when there is high recreational use (almost continuous occupancy) within Oregon Department of Environmental Quality sensitive zones or along streams above domestic water diversions of record.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Bacteria OAR 340-041-0009
Locate pack, riding, restoration, and logging stock facilities 200 feet away from watercourses upstream of source drinking diversions.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	• Antidegradation OAR 340-041-0004(1) • Bacteria OAR 340-041-0009 • Statewide Narrative OAR 340-041-0007(1) and (13)

Best Management Practices for Surface Source Water for Drinking Water	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Do not allow surface occupancy within 200 feet of a recorded domestic or public drinking water diversion.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	• Antidegradation OAR 340-041-0004(1) • Bacteria OAR 340-041-0009 • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033
Do not apply sewage sludge as a soil amendment in surface source water watersheds, above Domestic Water diversions of record, or within riparian management areas.	Toxic Pollutants: Leaching and surface water movement can transport toxics and bacteria downstream to water supply diversions. Some domestic supplies have no ability to detect or treat this pollution.	• Antidegradation OAR 340-041-0004(1) • Bacteria OAR 340-041-0009 • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033
Do not load, transfer, or store chemical, fuel, or fertilizer in sensitive zones in surface source water watersheds.	Toxic Pollutants, Oil, Gas, and Nutrients: Leaks, spills, and improper handling of pesticides, herbicides and petroleum products can leach or be transported by surface water to drinking water diversion points.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and(13) • Toxic Substances OAR 340-041-0033
Conduct equipment maintenance outside site-specific sensitive zones in surface source water watersheds.	Toxic Pollutants, Oil, and Gas: Leaks, spills, and improper handling petroleum products can leach or be transported by surface water to drinking water diversion points.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033
Use non-oil-based dust suppressants in surface source water watersheds.	Toxic Pollutants, Oil, and Gas: Leaks, spills, and improper application of oil based dust control products can introduce petroleum products to surface water and to drinking water diversion points.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033
Do not allow mineral lease surface occupancy within sensitive zones in surface source water watersheds.	Toxic Pollutants, Oil, and Gas: Leachate from mineral operations or equipment use may contain chemicals and wastes which is transported and delivered to drinking water diversion points.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033

Best Management Practices for Surface Source Water for Drinking Water	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Use fire retardant and surfactants as a last resort in fire suppression activities in surface source water watersheds.	Toxic Pollutants: Direct application of fire retardant and surfactants to waterbodies above drinking water intakes can cause delivery of Nitrate reaching concentrations as high as 33 mg/L, well above the primary water quality standard of 1 mg/L. The main chemical of concern in streams 24 hours after a retardant drop is un-ionized ammonia (NH3) is the principal toxic component to aquatic species.	• Antidegradation OAR 340-041-0004(1) • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033

Recreation

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 277. Best management practices for recreation

Best Management Practices for Recreation	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
All Recreation Facilities		
Implement erosion control measures on all recreation sites to stabilize exposed soils.	Coarse and Fine Sediment: Minimize sediment delivery to wetlands, floodplains, and waterbodies.	Turbidity OAR 340-041-0036
Locate new recreational facilities, developed and dispersed sites, outside of the water influence area or 100 feet from wetlands, floodplains, or waterbodies, whichever is greater. Low impact uses, such as hiking trails, picnic sites, or water dependant facilities (e.g., boat ramps or docks), are excluded.	Coarse and Fine Sediment: Minimize sediment delivery resulting from surface erosion.	• Bacteria OAR 340-041-0009 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Developed Recreation Sites		
Sealed vault toilets will be used at all developed recreational facilities, unless a sewage system and drainfield is approved by the Department of Environmental Quality.	Bacteria: Bacterial pollution from improperly constructed sanitation facilities could be injurious to the health of humans and aquatic organisms.	Bacteria OAR 340-041-0009
Construct and maintain refuse disposal sites to avoid water contamination.	Bacteria: Bacteria could enter surface and groundwater if garbage is not disposed of properly.	Bacteria OAR 340-041-0009

Best Management Practices for Recreation	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
When conducting recreation site maintenance, do not cut logs or coarse woody debris if any portion of that material extends in the active stream channel.	Coarse and Fine Sediment: Sediment storage, streambank stability, and reduction of turbidity.	• Antidegradation OAR 340-041-004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Water Dependent Facilities		
Construct boat ramps and approaches with hardened surfaces.	Coarse and Fine Sediment: Impacts to streambanks, turbidity	Turbidity OAR 340-041-0036
Off-Highway Vehicle (OHV) Trails		
Avoid construction of trails within RMAs.	Coarse and Fine Sediment: Surface erosion from trail tread to streams, floodplains, or wetlands.	Turbidity OAR 340-041-0036
Use existing hardened stream crossings to the extent possible when constructing trails through RMAs.	Coarse and Fine Sediment: Old roads converted to trails with rock surfacing at stream crossings reduce sedimentation for OHV trails.	Turbidity OAR 340-041-0036
When constructing or maintaining trails within Riparian Management Areas, do not cut logs or coarse woody debris if any portion of that material extends into the active stream channel.	Coarse and Fine Sediment: Sediment storage, streambank stability, and reduction of turbidity.	• Antidegradation OAR 340-041-004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Prohibit vehicle and off-highway vehicle use in streams, ponds, wetlands, and other waters.	Coarse Sediment, Fine Sediment, and Toxic Pollutants: Direct delivery of sediment and/or petroleum based fluids from vehicles is unnecessary degradation of waters of the State.	• Toxic substances OAR 430-041-0033 • Turbidity OAR 340-041-0036
Stream crossings would be designed to accommodate active channel width, bed load, and fish passage without exceeding capacity or diversion for the 100-year flood event.	Coarse and Fine Sediment: Floodwaters exceeding crossing capacity, causing overtopping of fills, with ensuing headcutting and loss of trail fill.	• Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 • Turbidity OAR 340-041-0036
Construct or maintain trails prior to the wet season.	Coarse and Fine Sediment: Sediment from trail related run-off.	Turbidity OAR 340-041-0036
Locate staging areas outside riparian management areas. Design or upgrade staging areas to prevent sediment/pollutant delivery to wetlands, floodplains, and waterbodies (e.g., rocking or hardening)	Coarse Sediment, Fine Sediment, and Toxic Pollutants: Stop sediment or petroleum products or from reaching streams.	• Toxic substances OAR 430-041-0033 • Turbidity OAR 340-041-0036

Best Management Practices for Recreation	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Harden trail approaches to stream crossings using materials such as geotextile fabric and crushed rock aggregate.	Coarse and Fine Sediment: Sediment from trail related run-off.	Turbidity OAR 340-041-0036
Drain dips will be installed on approaches to stream crossings and reinforced with rock for longevity. Drain dips would be placed within 100 feet of a stream. Large wood would be placed on both sides of the tread to keep riders on the trail and to contain any sediment movement.	Coarse and Fine Sediment: Sediment from trail related run-off.	Turbidity OAR 340-041-0036
Do not use pressure treated wood in construction of bridges over streams where materials are in contact with the stream or may leach into the soil or water.	Toxic Pollutants: Leaching of chemicals from treated wood into adjacent streams.	Toxic substances OAR 430-041-0033
During construction, perennial stream crossings may require a temporary flow diversion structure through the work area. (See Roads Section for Stream Crossing BMPs)	Coarse and Fine Sediment: Exposed soils may be vulnerable to erosion and sediment deposition into streams.	Turbidity OAR 340-041-0036
Prevent vehicle access to nearby wetlands by using suitable barriers.	Coarse and Fine Sediment: Defining trail route may prevent development of new trails into fragile areas susceptible to compaction and sediment transport to water resources.	Turbidity OAR 340-041-0036
Where trails intersect road ditches, provide hardened crossings. Divert water from the trail to keep from reaching wetlands, floodplains, and waterbodies.	Coarse and Fine Sediment - Exposed soils may be vulnerable to erosion, resulting in deposition to road ditches that could flow into nearby streams.	Turbidity OAR 340-041-0036
If trail width is deemed excessive for designated use (such as old roads converted to trails) one side of the trail will be tilled, covered with brush, and seeded or planted.	Coarse and Fine Sediment: Wider trails more prone to erosion and sediment delivery to waterbodies.	Turbidity OAR 340-041-0036
Repair rills and gullies using appropriately sized equipment or by hand.	Coarse and Fine Sediment: Unless tread erosion is maintained regularly, erosion escalates and can route sediment to waterbodies nearby.	Turbidity OAR 340-041-0036
Waterbars, drain dips, and lead off ditches will be constructed or repaired as needed. These features may need rock reinforcement to promote longevity. Drain dips or lead-off features are the preferred design.	Coarse and Fine Sediment: Drainage features can route run-off to stable vegetated land and avoid impacts on water quality.	Turbidity OAR 340-041-0036
Drain dips or lead off ditches will be constructed on steeper gradient trails and approaches to stream crossings.	Coarse and Fine Sediment: Drainage features protect steep trails from chronic erosion as well as leading off surface water before it could reach waterbodies.	Turbidity OAR 340-041-0036

Best Management Practices for Recreation	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Trails (Hiking)		
When constructing or maintaining trails within riparian management areas, do not cut logs or coarse woody debris if any portion of that material extends into the active stream channel. Use alternative passage options, such as earthen ramps, small notch steps, or slight trail realignments, to facilitate maintenance of intact logs.	Coarse and Fine Sediment: Sediment storage, streambank stability, and reduction of turbidity.	• Antidegradation OAR 340-041-004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Turbidity OAR 340-041-0036
Trail Closure		
Remove existing stream crossings or bridges. (See Road Decom. BMPs)	Coarse and Fine Sediment: Unmaintained crossings can fail and deliver sediment to streams.	Turbidity OAR 340-041-0036
Position fill or waste material in a location that would avoid direct or indirect sediment discharges to streams or wetlands.	Coarse and Fine Sediment: Until vegetation is established, or erosion control measures are undertaken, waste material is vulnerable to erosion.	Turbidity OAR 340-041-0036
Restored stream banks would be planted with native vegetation, straw mulched, and planted with water tolerant species where appropriate.	Coarse and Fine Sediment: Exposed soils are vulnerable to erosion in storm events and/or periods of high stream flows.	Turbidity OAR 340-041-0036
Barricade and brush in closed trails with nearby vegetation.	Coarse and Fine Sediment: Unrestricted access to unmaintained or abandoned trails can result in rill and gully erosion and sediment delivery to waterbodies.	Turbidity OAR 340-041-0036
Dispersed Recreation		
Site camps for permitted group overnight camping would be greater than 100 feet from surface water.	Coarse and Fine Sediment: Soil disturbance close to streams can result in sedimentation. Lack of developed and maintained sanitation facilities poses a risk of fecal coliform contamination.	• Bacteria OAR 340-041-0009 • Turbidity OAR 340-041-0036

Grazing

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 278. Best management practices for grazing

Best Management Practices for Grazing	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Fence water developments, including springs and seeps, unless other methods are available. Pipe overflow away from the developed source area.	Coarse Sediment, Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities.	• Antidegradation OAR 340-04I-0004 • Bacteria OAR 340-041-0009 • Biocriteria OAR 340-041-0011 • Dissolved Oxygen OAR 340-041-0016 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Do not locate salting areas within ¼ mile of permanent water sources or riparian management areas.	Coarse Sediment, Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities	• Antidegradation OAR 340-04I-0004 • Bacteria OAR 340-041-0009 • Biocriteria OAR 340-041-0011 • Dissolved Oxygen OAR 340-041-0016 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
• Locate new livestock handling or management facilities (corrals, pens, or holding pastures) outside riparian management areas or 200 eet from waterbodies and on level ground where drainage would not enter surface waters. • If existing livestock handling facilities inside riparian management areas, do not meet water quality through use of BMPs, relocate or remove such facilities away from riparian management areas.	Coarse Sediment, Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities	• Antidegradation OAR 340-04I-0004 • Bacteria OAR 340-041-0009 • Biocriteria OAR 340-041-0011 • Dissolved Oxygen OAR 340-041-0016 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036

Best Management Practices for Grazing	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Apply specific grazing strategies for riparian wetland areas, including timing, intensity, or exclusion for maintenance of proper functioning condition. Use one or more of the following features: • Inclusion of the waterbodies, floodplains, and wetlands within a separate pasture. • Fence or herd livestock out of waterbodies, floodplains, and wetlands for as long as necessary to allow vegetation to recover. • Control the timing of grazing to keep livestock off streambanks when they are most vulnerable to damage and to coincide with the physiological needs of target plant species. • Add more rest to the grazing cycle to increase plant vigor, allow streambanks to revegetate, or encourage more desirable plant species composition. • Limit grazing intensity to a level that will maintain desired species composition and vigor. • Permanently exclude livestock from those waterbodies, floodplains, and wetlands areas that are at high risk and have poor recovery potential, and when there is no practical way to protect them while grazing adjacent uplands.	Coarse Sediment, Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities	• Antidegradation OAR 340-04I-0004 • Bacteria OAR 340-041-0009 • Biocriteria OAR 340-041-0011 • Dissolved Oxygen OAR 340-041-0016 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Recover degraded waterbodies through adjustments to forage utilization levels, improved livestock distribution, and management through fencing, vegetation treatments, water source developments, or changes in season of use or livestock numbers.	Coarse Sediment, Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities	• Antidegradation OAR 340-04I-0004 • Bacteria OAR 340-041-0009 • Biocriteria OAR 340-041-0011 • Dissolved Oxygen OAR 340-041-0016 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036

Minerals Exploration and Development

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 279. Best management practices for minerals exploration and development

Best Management Practices for Minerals Exploration and Development	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
All Minerals		
Locate, design, operate, and maintain settling ponds to contain sediment discharges.	Coarse and Fine Sediment: Sediment could be transported to nearby streams from improperly designed or overflowing settling ponds.	Turbidity OAR 340-041-0036
Use existing roads, skid trails, and stream crossings.	Coarse and Fine Sediment: Potential sedimentation is reduced by minimizing new soil disturbance near streams.	Turbidity OAR 340-041-0036
Storm proof all natural surface roads and trails when an operation halts for the wet season. See Roads and Landings section for guidelines.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbody.	Turbidity OAR 340-041-0036
Locate and maintain sanitation facilities where overflow or discharges would not enter surface water. Where possible, locate these facilities outside of riparian management areas.	Bacteria: Bacterial pollution from improperly constructed sanitation facilities could be injurious to the health of humans and aquatic organisms.	Bacteria OAR 340-041-0009
Locate structures and support facilities, including new roads, at least 200 feet from water bodies, floodplains, and wetlands.	Coarse Sediment, Fine Sediment, and Temperature: Developed sites can channel water and sediment into nearby waterbodies. Loss of riparian vegetation due to development could reduce shade and increase water temperature.	• Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Design, locate, and construct stream crossings in conformance with practices described in Roads and Landings section.	Coarse and Fine Sediment: Earthwork near streams can expose erodible soils and result in sedimentation to streams.	Turbidity OAR 340-041-0036
If roads are used during wet seasons with potential for sediment delivery to stream channels, rock aggregate would be used to surface those roads.	Coarse and Fine Sediment: Use of native surfaced roads during wet weather could result in unnecessary and undue degradation of water quality in nearby streams.	Turbidity OAR 340-041-0036
Prior to fall rains, reclaim all roads and trails constructed for exploratory purposes that are unnecessary for the mineral access.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbody.	Turbidity OAR 340-041-0036
Retain an undisturbed riparian buffer strip between mineral operations and water bodies, floodplains, and wetlands.	Coarse Sediment, Fine Sediment, and Temperature: Protect integrity of streambanks, provide for water temperature control and for filtration of sediment from surface runoff	• Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036

Best Management Practices for Minerals Exploration and Development	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Stockpile available topsoil for use during reclamation of the site. Stockpiled topsoil would be stabilized to prevent erosion and contamination of other resources in the area.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
On access roads to mineral sites where no future entry is planned, reclaim these access roads. This may include tilling, water barring, blocking, recontouring, fertilization, planting, mulching, and seeding.	Coarse and Fine Sediment: Soil erosion of exposed surfaces with potential transport to the channel, floodplain, or wetlands.	Turbidity OAR 340-041-0036
Reclaim depleted or closed mineral sites by stabilizing and contouring the mining area. Replace topsoil and mulch, seed, and plant.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
Locate exploratory drill sites next to or on existing roads. Install erosion control structures to limit sediment transport off-site.	Coarse and Fine Sediment: Minimize soil disturbance to reduce potential for erosion and sediment delivery to streams.	Turbidity OAR 340-041-0036
Protect exposed soils from erosion by seeding, mulching, etc when constructing wells.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
Locatable Minerals		
Comply with seasonal restrictions on suction dredging identified in Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources when discharging to Oregon's surface waters.	Coarse and Fine Sediment: Suction dredging can deposit fine sediment in gravels which is deleterious to fish and aquatic life. It can also be injurious to public health and recreation.	• Biocriteria OAR 340-041-0011 • Turbidity OAR 340-041-0036
Design new projects to contain waste products and prevent leaching contaminants from entering surface and ground water.	Toxic Substances: Mine generated waste and runoff can negatively impact surface or groundwater quality and impair aquatic habitat.	• Biocriteria OAR 340-041-0011 • Toxic substances OAR 430-041-0033
Do not locate toxic mine waste (e.g., waste rock, spent ore, or tailings) in riparian management areas.	Toxic Substances: Mine generated waste and runoff can negatively impact surface or groundwater quality and impair aquatic habitat.	Toxic substances OAR 430-041-0033
Reclaim mine waste after operations to ensure chemical and physical stability according to DOGAMI requirements.	Toxic Substances: Mine generated waste and runoff can negatively impact surface or groundwater quality and impair aquatic habitat.	• Toxic substances OAR 430-041-0033 • Turbidity OAR 340-041-0036
Stabilize exposed soils by seeding and mulching and provide for non-erosive drainage from disturbed areas that were constructed or renovated for mining activities.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
When operating during the wet season, stabilize disturbed areas that will not be mined for at least 30 days.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036

Best Management Practices for Minerals Exploration and Development	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Prohibit surface occupancy within 200 feet of streams or other waterbodies.	Coarse Sediment, Fine Sediment, Temperature, and Bacteria: Developed sites can channel water and sediment into nearby waterbodies. Loss of riparian vegetation due to development could reduce shade and increase water temperature. Bacterial pollution could be injurious to the health of humans and aquatic organisms.	• Bacteria OAR 340-041-0009 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Salable Minerals		
Locate stockpile sites on stable ground where the material would not move into waterbodies, floodplains, and wetlands.	Coarse and Fine Sediment: Placement of soil and rock stockpiles on unstable landforms can result in landslides with drainage of sediment-laden water to streams.	Turbidity OAR 340-041-0036
Locate, design, and construct salable mineral sites to minimize sedimentation to streams. Close roads, excavations and crusher pads in accordance with Roads and Landings section when the salable mineral site is depleted.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
Do not develop or expand quarries within the riparian management area or within 200 feet of waterbodies, floodplains, and wetlands, whichever is greater.	Coarse Sediment, Fine Sediment, and Temperature: Developed sites can channel water and sediment into nearby waterbodies. Loss of riparian vegetation due to development could reduce shade and increase water temperature. Sedimentation in streams from road related runoff can impair aquatic habitat.	• Biocriteria OAR 340-041-0011 • Temperature OAR 340-041-0028 • Turbidity OAR 340-041-0036
Use culverts and rip-rap for crusher pad drainage when necessary.	Coarse and Fine Sediment: Effective drainage of surface runoff prevents sediment delivery to streams.	Turbidity OAR 340-041-0036
Use erosion-reduction practices, such as seeding, mulching, and woody debris placement, to limit erosion and transport of sediment to streams from quarries or other common variety mineral sites. Provide drainage from stockpiles and salable mineral sites that is dispersed over stable vegetated areas rather than directly into stream channels.	Coarse and Fine Sediment: Soil erosion of exposed surfaces with potential transport to the channel, floodplain, or wetlands.	Turbidity OAR 340-041-0036

Best Management Practices for Minerals Exploration and Development	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Limit collection of decorative rock to outside of riparian management areas and floodplains.	Coarse and Fine Sediment: Removing rock from the RMA or floodplain affects channel structure and results in a reduction in energy dissipation capability, potentially decreasing bank and floodplain stability during flood events, releasing stored fine sediment, and increasing the proportion of fine sediments in streams (removing the rocks, leaving the fines). Also, removal of large rocks within the RMA may necessitate the use of ground-based equipment that would cause soil disturbance and the potential for sediment delivery.	Turbidity OAR 340-041-0036
Leasable Minerals		
Stabilize roads, drill sites, and excavation areas to a free draining and non eroding condition from disturbed areas that are constructed or renovated for leasable mineral activities (e.g., roads, drill sites, and excavation areas).	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
When operating during the wet season, stabilize disturbed areas that will remain inactive for at least 30 days.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
Line all mud pits that contain drilling fluid to prevent leaking.	Coarse and Fine Sediment: Drilling fluid can leak from unlined pits to surface and groundwater resources.	• Toxic substances OAR 430-041-0033 • Turbidity OAR 340-041-0036
Limit drill site construction and access through riparian management areas to established roadways unless the operator submits a plan that demonstrates that impacts to water quality from the proposed action can be adequately mitigated.	Coarse and Fine Sediment: Protect integrity of streambanks, provide for water temperature control and for filtration of sediment from surface runoff. Drilling and equipment fluids can negatively impact surface or groundwater quality and impair aquatic habitat.	• Temperature OAR 340-041-0028 • Toxic substances OAR 430-041-0033 • Turbidity OAR 340-041-0036

Spill Prevention and Abatement

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 280. Best management practices for spill prevention and abatement

Best Management Practices for Spill Prevention and Abatement	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Heavy Equipment Use		
• Require inspection and cleaning as necessary of heavy equipment prior to moving onto the project site in order to remove oil and grease, noxious weeds, and excessive soil. • Ensure that hydraulic fluid and fuel lines on heavy-mechanized equipment are in proper working condition. • Maintain and refuel equipment a minimum of 100 feet away from streams and other waterbodies. • In the event of a spill or release, all reasonable and safe actions to contain the material will be taken. Specific actions are dependent on the nature of the material spilled. • Use spill containment booms or as required by DEQ. Have booms and other absorbent containment materials on site and ready to deploy. • Immediately remove waste or spilled hazardous materials (including but not limited to diesel, oil, hydraulic fluid) and contaminated soils near any stream or other waterbody, and dispose of it/them in accordance with the applicable regulatory standard. Notify OERS of any spill over the material RQ, and any spill not totally cleaned up after 24 hours • Store equipment containing toxic fluids away from streams or other waterbodies.	Toxic Substances: Contaminants from equipment leaking into waterbodies.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033

Best Management Practices for Spill Prevention and Abatement	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Fuel and Chemical Transport		
If more than 42 gallons of fuel or combined quantity of petroleum product and chemical substances would be transported to a project site, the following precautions will be implemented. 1. Plan a safe route and material transfer sites so that all spilled material will be contained easily at that designated location. 2. Plan an active dispatch system that can relay the information to appropriate resources. 3. Ensure a spill containment kit that can adsorb and contain 55 gallons of petroleum product and chemical substances is readily available. 4. Provide for immediate notification to OERS in the event of a spill. Have a radio-equipped vehicle lead the chemical or fuel truck to the project site. 5. Assemble a spill notification list that includes the district hazardous materials coordinator, DEQ, and spill clean-up contractors. 6. Construct a downstream water user contact list with addresses and phone numbers. 7. When operating within Source Water watersheds, pre-estimate water flow travel times through the watershed to predict downstream arrival times. 8. Be prepared to sample water and carry sample containers. 9. Be prepared to assist OSP and ODFW assess wildlife impacts of any material spilled.	Toxic Substances: Chemical contamination of waterbodies.	• Antidegradation OAR 340-041-0004(1) • Biocriteria OAR 340-041-0011 • Statewide Narrative OAR 340-041-0007(1) and (13) • Toxic Substances OAR 340-041-0033
Spill Abatement		
Spill Prevention, Control, and Countermeasure Plan (SPCC): All operators shall develop a modified SPCC plan prior to initiating project work if there is a potential risk of chemical or petroleum spills near water bodies. The SPCC plan will include the appropriate containers to be used and design of the material transfer locations. No interim fuel depot or storage location other than a manned transport vehicle.	Toxic Substances: Chemical or petroleum product routing to water bodies.	[40 CFR 112] 42 U.S. Gallons for reportable quantities not involving waterways, a visible sheen where waterways are involved

Best Management Practices for Spill Prevention and Abatement	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Spill Containment Kit (SCK): All operators shall have a SCK as described in the SPCC plan on-site during any operation with potential for run-off to adjacent water bodies. The SCK will be appropriate in size and type for the oil or hazardous material carried by the operator.	Toxic Substances: Chemical or petroleum product routing to water bodies.	OAR-340-142-[0030]
Operators shall be responsible for the clean-up, removal, and proper disposal of contaminated materials from the site.	Toxic Substances: Chemical or petroleum product routing to water bodies.	• OAR-340-102-[inclusive] • OAR-340-122-[inclusive]

Restoration

See *Summary of Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Table 281. Best management practices for restoration

Best Management Practices for Restoration	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Confine work in the stream channels to the low flow period.	Coarse and Fine Sediment: Concentrated turbidity and sedimentation potential due to channel disturbance during low flow conditions.	• Accumulation of bottom deposits OAR-340-041-0007 • Turbidity OAR-340-041-0036
In stream channels that are sensitive to disturbance (e.g., meadow streams), do not drive heavy equipment in flowing channels and floodplains.	Coarse and Fine Sediment: Disturbance of stream channel and streambanks resulting in erosion, sedimentation, turbidity, and loss of channel stability.	• Accumulation of bottom deposits OAR-340-041-0007 • Turbidity OAR-340-041-0036
In well armored channels that are resistant to damage (e.g., bedrock, small boulder, or cobble dominated), consider conducting the majority of heavy-equipment work from within the channel to minimize damage to sensitive riparian areas.	Coarse Sediment, Fine Sediment, and Temperature: Disturbance of floodplain and streambanks resulting in erosion, sedimentation, turbidity, and loss of stream shade.	• Turbidity OAR-340-041-0036 • Water Temperature OAR-340-041-0028
Design access routes for individual work sites to reduce exposure of bare soil and extensive streambank shaping.	Coarse and Fine Sediment: Soil erosion with potential transport to the channel and floodplain.	Turbidity OAR-340-041-0036
Confine heavy-equipment use in the streambed to the area necessary by working from the bank or a temporary structure for installation of structure to avoid flowing water.	Coarse and Fine Sediment: Excess disturbance of streambed and banks resulting in erosion, sedimentation and turbidity.	Turbidity OAR-340-041-0036
Limit the number and length of equipment access points through riparian management areas.	Coarse Sediment, Fine Sediment, and Temperature: Disturbance of floodplain and streambanks resulting in erosion, sedimentation, turbidity, and loss of stream shade.	• Turbidity • OAR-340-041-0036 • Water Temperature OAR-340-041-0028

Best Management Practices for Restoration	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Limit the amount of streambank excavation to the minimum necessary to ensure stability of enhancement structures. Provide isolation from flowing water during excavation. Place excavated material above the flood prone area and cover or place a berm to avoid its reentry into the stream during high flow events.	Coarse and Fine Sediment: Sedimentation during high flow events resulting in erosion, sedimentation and turbidity.	• Accumulation of bottom deposits OAR-340-041-0007 • Turbidity OAR-340-041-0036
Obtain logs for habitat restoration structures from outside the riparian management area or at least 100 feet from the stream channel.	Temperature: Removal of stream shade and future source of large woody material, loss of root stability on stream banks.	Water Temperature OAR-340-041-0028
Inspect all mechanized equipment daily for leaks and clean as necessary to help ensure that toxic materials, such as fuel and hydraulic fluid, do not enter the stream.	Oil, Gas, and Chemical Fluids: Direct entry of oil and gas into waterbody	Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007
Equipment will not be stored in stream channels when not in use.	Oil, Gas, and Chemical Fluids: Direct entry of oil and gas into waterbody	Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007
When using heavy equipment in or adjacent to stream channels during restoration activities, develop and implement an approved spill containment plan that includes having a spill containment kit on-site and at previously identified containment locations.	Oil, Gas, and Chemical Fluids: Direct entry of oil and gas into waterbody	Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007
Refuel equipment, including chainsaws and other hand power tools, at least 100 feet from water bodies (or as far as possible from the water body where local site conditions do not allow a 150-foot setback) to prevent direct delivery of contaminants into a water body.	Oil, Gas, and Chemical Fluids: Direct entry of oil and gas into waterbody	Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007
Use waterbars, barricades, seeding, and mulching to stabilize bare soil areas along project access routes prior to the wet season.	Coarse and Fine Sediment: Excessive turbidity and sedimentation to downstream areas due to erosion of disturbed soils.	Turbidity OAR-340-041-0036
Rehabilitate and stabilize disturbed areas where soil will support seed growth by seeding and planting with native seed mixes or plants, or using erosion control matting.	Coarse and Fine Sediment: Excessive turbidity and sedimentation to downstream areas due to erosion of disturbed soils.	Turbidity OAR-340-041-0036
When replacing culverts, install grade control structures (e.g., boulder vortex weirs or boulder step weirs).	Coarse and Fine Sediment: Excessive turbidity and sedimentation to downstream areas due to erosion of upstream sand/gravel/cobble deposits.	• Accumulation of bottom deposits OAR-340-041-0007 • Turbidity OAR-340-041-0036

Best Management Practices for Restoration	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
Rehabilitate headcuts and gullies.	Coarse and Fine Sediment: Excessive turbidity and sedimentation to downstream areas due to erosion of upstream sand/gravel/cobble deposits.	• Accumulation of bottom deposits OAR-340-041-0007 • Turbidity OAR-340-041-0036
Install turbidity control structures (e.g., isolation, diversioin, or silt curtains) immediately downstream of in-stream restoration work areas. Remove these structures following completion of turbidity generating activities.	Coarse and Fine Sediment: Excessive turbidity to downstream areas generated during instream structure placement.	Turbidity OAR-340-041-0036
Klamath Falls: During restoration projects involving juniper control or prescribed burns, design projects so that adequate soil cover remains (either by leaving cut trees in place for many years or by lopping and scattering branches); and adequate herbaceous seed source or seed bed is available (either naturally or through seeding), and ensure that subsequent management of the site addresses other limiting factors caused by management (e.g., livestock use or recreation).	Coarse and Fine Sediment: Soil erosion with potential transport to the channel and floodplain.	Turbidity OAR-340-041-0036

Summary of Oregon Water Quality Standards

This section summarizes the Oregon standards and regulations for water quality that are associated with the best management practices.

Statewide Narrative Criteria

The following are the Oregon administrative rules (OARs) for the statewide narrative criteria for water quality by name, number, and descriptive excerpt.

- **Antidegradation (OAR 340-041-0004)**
  "The purpose of the Antidegradation Policy is to guide decisions that affect water quality such that unnecessary further degradation from new or increased point and nonpoint sources of pollution is prevented, and to protect, maintain, and enhance existing surface water quality to ensure the full protection of all existing beneficial uses."

  Note: The antidegradation policy applies to all 303(d) listed waterbodies when a project could further degrade the water quality.

- **Statewide Narrative Criteria Biological Criteria (OAR 340-041-0007)**
  "(11) The development of fungi or other growths having a deleterious effect on stream bottoms, fish or other aquatic life, or that are injurious to health, recreation, or industry may not be allowed."

- **Statewide Narrative Criteria Oil and Floating Solids (OAR 340-041-0007)**
  "(14) Objectionable discoloration, scum, oily sheens, or floating solids, or coating of aquatic life with oil films may not be allowed."

- **Statewide Narrative Criteria Road Building Waste Materials (OAR 340-041-0007)**
  "(9) Road building and maintenance activities must be conducted in a manner so as to keep waste materials out of public waters and minimize erosion of cut banks, fills, and road surfaces."

- **Statewide Narrative Criteria Sediment, Adverse Deposits (OAR 340-041-0007)**
  "(13) The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed."

- **Statewide Narrative Criteria Summary (OAR 340-041-0007)**
  "(1) Notwithstanding the water quality standards contained in this Division, the highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels."

Oregon Water Quality

For information about Oregon's water quality standards and a complete list of Oregon's administrative rules (OARs) for water quality, see http://www.deq.state.or.us/regulations/rules.htm. and http://www.deq.state.or.us/wq/standards/stanards.htm.

- **Statewide Narrative Criteria Toxics (OAR 340-041-0007)**
  "(12) The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish may not be allowed."

Statewide Numeric Criteria

The following are the Oregon administrative rules (OARs) for the statewide numeric criteria for water quality by name, number, and descriptive excerpt.

- **Bacteria (OAR 340-041-0009)**
  "(1) Numeric Criteria: Organisms of the coliform group commonly associated with fecal sources (MPN) or equivalent membrane filtration using a representative number of samples) may not exceed the criteria described in paragraphs (a) and (b) of this paragraph:
  (a) Freshwaters and Estuarine Waters Other than Shellfish Growing Waters:
  (A) A 30-day log mean of 126 *E. coli* organisms per 100 milliliters, based on a minimum of five (5) samples;
  (B) No single sample may exceed 406 *E. coli* organisms per 100 milliliters."

- **Biocriteria (OAR 340-041-0011)**
  "Waters of the State must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities."

- **Dissolved Oxygen (OAR 340-041-0016)**
  "Dissolved oxygen (DO): No wastes may be discharged and no activities must be conducted that either alone or in combination with other wastes or activities will cause violation of the following standards: The changes adopted by the Commission on January 11, 1996, become effective July 1, 1996. Until that time, the requirements of this rule that were in effect on January 10, 1996, apply:
  (1) For waterbodies identified as active spawning areas in the places and

times indicated on the following Tables and Figures set out in OAR 340-041-0101 to 340-041-0340: Tables 101B, 121B, 180B, 201B and 260B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B, (as well as any active spawning area used by resident trout species), the Rules of this Division as last modified by the EQC 05/20/2004 following criteria apply during the applicable spawning through fry emergence periods set forth in the tables and figures:
(a) The dissolved oxygen may not be less than 11.0 mg/l. However, if the minimum intergravel dissolved oxygen, measured as a spatial median, is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l;
(b) Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/l or 9.0 mg/l criteria, dissolved oxygen levels must not be less than 95 percent of saturation;
(c) The spatial median intergravel dissolved oxygen concentration must not fall below 8.0 mg/l.
(2) For waterbodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen may not be less than 8.0 mg/l as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/l, dissolved oxygen may not be less than 90 percent of saturation. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 8.0 mg/l as a 30-day mean minimum, 6.5 mg/l as a seven-day minimum mean, and may not fall below 6.0 mg/l as an absolute minimum (Table 21);
(3) For waterbodies identified by the Department as providing cool-water aquatic life, the dissolved oxygen may not be less than 6.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 6.5 mg/l as a 30-day mean minimum, 5.0 mg/l as a seven-day minimum mean, and may not fall below 4.0 mg/l as an absolute minimum (Table 21);
(4) For waterbodies identified by the Department as providing warm-water aquatic life, the dissolved oxygen may not be less than 5.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 5.5 mg/l as a 30-day mean minimum, and may not fall below 4.0 mg/l as an absolute minimum (Table 21);
(5) For estuarine water, the dissolved oxygen concentrations may not be less than 6.5 mg/l (for coastal waterbodies)."

- **Temperature (OAR 340-041-0028)**
  "A. The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning use may not exceed 55.4 degrees Fahrenheit. B. The seven-day-average maximum temperature of a stream identified as having core cold water habitat use may not exceed 60.8 degrees Fahrenheit. C. The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use may not exceed 64.4 degrees Fahrenheit. D. The seven-day-average maximum temperature of a stream identified as having a migration corridor use may not exceed 68.0 degrees Fahrenheit."

- **Turbidity (OAR 340-041-0036)**
  "No more than a ten percent cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity."



Appendix J. Recreation

This appendix provides supplemental material for the recreational topics discussed in this draft environmental impact statement.

In this appendix:

Interim Off-highway Vehicle Management Guidelines 1191

Planning Frameworks for Special Management Areas 1208

Interim Off-highway Vehicle Management Guidelines

This section provides interim off-highway vehicle (OHV) management guidelines that would be implemented until subsequent transportation management plans are completed. These interim guidelines have been developed at the district level, for OHV emphasis areas, and for the Heceta Dunes ACEC on the Eugene District. These guidelines are presented in the order of Salem, Eugene, Roseburg, Coos Bay, Medford (the five western Oregon BLM districts), and Klamath Falls (one of the resource areas of the Lakeview District).

Maps associated with these interim OHV management guidelines are available at BLM district offices. These maps show OHV area designations, a preliminary road and trail network, and BLM lands that have secured legal public access. See Chapter 2 for a listing of individual closed areas and OHV emphasis areas by district.

BLM road maintenance levels that pertain to limitations on types of OHV use are described below.

Level 1 – This level is assigned to roads where minimum maintenance is required to protect adjacent lands and resource values. Emphasis is given to maintaining drainage and runoff patterns as needed to protect adjacent lands. Grading, brushing, or slide removal is not performed unless roadbed drainage is being adversely affected, causing erosion. Closure and traffic restrictive devices are maintained as needed.

Level 2 – This level is assigned to roads that are passable by high clearance vehicles. Drainage structures are to be inspected within a 3-year period and maintained as needed. Grading is conducted as necessary to correct drainage problems. Brushing is conducted as needed to allow access. These are typically low standard, low volume, single lane, natural and aggregate surfaced, and are functionally classified as a resource road.

Level 3 – This level is assigned to roads where management objectives require the road to be open seasonally or year-round for commercial, recreational, or administrative access. Typically, these roads are natural or aggregate surfaced, but may include low use bituminous surfaced road. These roads have a defined cross section with drainage structures (e.g., rolling dips, culverts, or ditches). These roads may be negotiated by passenger cars traveling at prudent speeds. User comfort and convenience are not considered a high priority. Drainage structures are to be inspected at least annually and maintained as needed. Grading is conducted to provide a reasonable level of riding comfort at prudent speeds for the road conditions. Brushing is conducted as needed to improve sight distance.

Level 4 – This level is assigned to roads where management objectives require the road to be open all year (except may be closed or have limited access due to snow conditions) and which connect major administrative features (recreational sites, local road systems, administrative sites, etc.) to County, State, or Federal roads. Typically these roads are single or double lane, aggregate, or bituminous surface, with a higher volume of commercial and recreational traffic than administrative traffic.

Salem District

OHV Designations:

Limited to designated roads and trails: 291,969 acres

Limited to designated roads: 85,165 acres

Closed: 26,208 acres

Description:

Includes all BLM lands located within the Salem District. See additional interim guidelines for the Upper Nestucca OHV Emphasis Area.

Limited Area Management Guidelines:

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or their use limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, protection of cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

Closed Area Management Guidelines:

- All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

Process for on-going public collaboration/outreach:

- The principle venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.

- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the main office illustrating designations, describing specific restrictions, and defining opportunities.

Process for selecting a final road and trail network:

Route designations have been completed for the Upper Nestucca OHV Emphasis Area. Final route designations for the rest of the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

Road and trail construction and maintenance standards:

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.

Upper Nestucca OHV Emphasis Area

Acres: 9,579

OHV Designation:

Limited to designated roads and trails

Niche: Located 20 miles northwest of McMinnville, Oregon, this area provides Class I (ATVs) and Class III (motorcycles) OHV riding experience along a designated road and trail network.

Management Guidelines:

- Designated trails and maintained roadways are limited to Class I and Class III motor vehicle use within the boundaries of the OHV emphasis area.

- All Class I and Class III vehicles must be equipped with approved spark arresters, an Oregon ATV sticker for the appropriate vehicle class, and must meet posted noise requirements.
- Class II vehicle use is only authorized on Level 3 and Level 4 roadways.
- Motorized use on the trail system may be restricted during summer months due to fire hazard conditions.
- Areas and trails may be permanently or temporarily closed for administrative use, extreme wet conditions, construction/reconstruction requirements, or other environmental concerns.

Process for on-going public collaboration/outreach:

The principle venue for public collaboration on the trail system is through local partnership with the Applegate Rough Riders Motorcycle Club. A trail map is available to the public at the Salem District Office and Tillamook Field Office. The trail system is marked on the ground with regulatory and directional signage.

Process for selecting a final road and trail network:

Route designations have been completed through the Upper Nestucca Motorcycle Trail System Environmental Assessment (EA OR 086-97-05). Adaptive management is used to adjust the system for timber management, user needs, and resource protection.

Road and trail construction and maintenance standards:

Construction and maintenance are completed in accordance with the design features identified in the Monitoring and Maintenance Plan for the Upper Nestucca OHV Trail System. Trail maintenance will be a priority within this OHV emphasis area to ensure a quality riding experience for trail users and to conserve natural resource values.

Eugene District

OHV Designations:

Limited to designated roads and trails: 308,595 acres

Closed: 5,187 acres

Description:

Includes all BLM lands located within the Eugene District. See additional interim guidelines for the Shotgun Creek OHV Emphasis Area and the Heceta Dunes Area of Critical Environmental Concern.

Limited Area Management Guidelines:

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

Closed Area Management Guidelines:

- All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

Process for on-going public collaboration/outreach:

- The principle venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the main office illustrating designations, describing specific restrictions, and defining opportunities.

Process for selecting a final road and trail network:

Route designations have been completed for the Upper Lake Creek Special Recreation Management Area and the Shotgun Creek OHV Emphasis Area. Final route designations for the rest of the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

Road and trail construction and maintenance standards:

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.

Shotgun Creek OHV Emphasis Area

Acres: 8,090

OHV Designation:

Limited to designated roads and trails

Niche: Offers a multiple-use, single-track trail riding experience for motorcycle riders, ATV riders, and four-wheel drive enthusiasts.

Management Guidelines:

- The trail system is available to Class I (ATVs), Class II (4WDs) and Class III (motorcycles) motorized vehicles with Oregon ATV permits.
- Routes open to OHV use will be signed and mapped.
- Routes available for OHV use may change periodically due to timber harvest activity or trail rehabilitation.

Process for on-going public collaboration/outreach:

The principle venue for public collaboration on the trail system is through local partnership relationships with the Emerald Trail Riders Association, the Junction

City Jeepers, and other user groups. A trail map is available to the public at the Eugene District Office and will be updated as trail routes change. The trail system is marked on the ground with regulatory and directional signs.

Process for selecting a final road and trail network:

Route designations were completed through two Shotgun OHV Trail System Environmental Assessments (EA OR 090-00-04 and EA OR 090-06-04). Adaptive management will be used to adjust the system for approved timber harvesting, user needs, and resource protection. These modifications will be accomplished in collaboration with trail partners and users.

Road and trail construction and maintenance standards:

Trail maintenance will be a priority within this OHV emphasis area to ensure quality riding experiences for trail users and to conserve natural resource values.

Heceta Dunes Area of Critical Environmental Concern

Acres: 200

OHV Designation:

Open: 77 acres

Closed: 133 acres

Niche: Offers an open sand dune riding experience for OHV riders within a portion of the ACEC.

Management Guidelines:

- OHV use is limited to an open sand dune areas and connector routes between open dunes, as mapped. All other portions of the ACEC are closed to OHV use.
- Supplemental rules regulating other activities, such as camping, may be established in coordination with the USFS.

Process for on-going public collaboration/outreach:

Signs will be installed and maps made available to the public that clearly delineate the open OHV area. BLM shall coordinate outreach efforts with the U.S. Forest Service.

Process for selecting a final road and trail network:

The area open to OHV use will be delineated to avoid rare plant habitats and private land. The "open" area delineation will be coordinated with the adjacent open area on U.S. Forest Service lands.

Roseburg District

OHV Designations:

Limited to designated roads and trails: 415,658 acres

Closed: 10,643 acres

Description:

Includes all BLM lands located within the Roseburg District. See additional interim guidelines for the Hubbard Creek OHV Emphasis Area.

Limited Area Management Guidelines:

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicle use and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

Closed Area Management Guidelines:

- All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

Process for on-going public collaboration/outreach:

- The principle venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the Roseburg District office illustrating designations, describing specific restrictions, and defining opportunities.

Process for selecting a final road and trail network:

Final route designations for the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

Road and trail construction and maintenance standards:

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.

Hubbard Creek OHV Emphasis Area

Acres: 12,041

OHV Designation:

Limited to designated roads and trails

Niche: Offers a multiple-use trail riding experience for motorcycles, ATVs, and 4X4 vehicles.

Management Guidelines:

- Paved roads are limited to licensed, street-legal vehicles only.
- Level 1and 2 routes are open to Class I (ATVs), Class II (4X4s) and Class III (motorcycles) vehicles according to width. Trails under 50 inches wide are restricted to Class I and Class III vehicles.
- ATVs and motorcycles must have Oregon ATV permits.
- Non-motorized travel (horseback riding, hiking, and mountain biking) is allowed on all access routes, but is not encouraged due to potential conflicts and safety hazards.
- Motorized use on the trail system may be restricted during the summer due to fire hazard conditions, as determined by Douglas Forest Protective Association.

Process for on-going public collaboration/outreach:

The principle venue for public collaboration on the trail system is through partnerships with the local motorcycle and 4X4 associations.

Process for selecting a final road and trail network:

No route designations were made in the previous planning effort since it was designated as limited to existing roads and trails. After completion the RMP revision, a road and trail inventory and designation process for the area will be developed.

Road and trail construction and maintenance standards:

Trail maintenance will be a priority within this OHV emphasis area to ensure a quality riding experience for trail users, to minimize user conflicts, promote safety for users, and conserve resource values.

Coos Bay District

OHV Designations:

Limited to designated roads and trails: 318,674 acres

Closed: 3,489 acres

Description:

Includes all BLM lands located within the Coos Bay District. See additional interim guidelines for the Blue Ridge OHV Emphasis Area.

Limited Area Management Guidelines:

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicle use and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

Closed Area Management Guidelines:

- All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

Process for on-going public collaboration/outreach:

- The principle venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the Coos Bay District office illustrating designations, describing specific restrictions, and defining opportunities.

Process for selecting a final road and trail network:

Route designations have been completed for the New River ACEC and the Blue Ridge OHV Emphasis Area. Final route designations for the rest of the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

Road and trail construction and maintenance standards:

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.

Blue Ridge OHV Emphasis Area

Acres: 1,609

OHV Designation:

Limited to designated roads and trails

Niche: Offers a multiple-use, single-track trail riding experience for hikers, equestrians, mountain bikers, and motorcycle riders.

Management Guidelines

- Level 3 and 4 BLM roads are limited to street-legal vehicles only.
- The single-track trail system is available to Class III (motorcycles) vehicles with Oregon ATV permits and all non-motorized modes of travel.
- Motorized, mechanized, and equestrian use is prohibited between December and April to prevent excessive damage to the trail tread when soil moisture conditions are high. Motorized use on the trail system may be restricted during summer months due to fire hazard conditions.

Process for on-going public collaboration/outreach:

The principle venue for public collaboration on the trail system is through local partnership relationships with the South Coast Trail Riders, Oregon Equestrian Trails, and the Coos Regional Trail Partnership. A printed trail map is available to the public at the Coos Bay District office and on the Coos Regional Trail Partnership webpage. The trail system is marked on the ground with regulatory and directional signage.

Process for selecting a final road and trail network:

Route designations were completed through the Blue Ridge Multiple Use Trail System environmental assessment (EA OR-125-98-18). Adaptive management will be used to adjust the system for commercial timber production demands, user needs and resource protection. These modifications will be accomplished in collaboration with trail partners and users and through amendments to the Blue Ridge Trail system plan and EA.

Road and trail construction and maintenance standards:

Construction and maintenance shall be done in accordance with the design features identified in the EA and standards in BLM Manual H-9114-1 and other professional sources. Trail maintenance will be a priority within this OHV emphasis area to ensure a quality riding experience for trail users and to conserve natural resource values.

Medford District

OHV Designations:

Limited to designated roads and trails: 825,188 acres

Closed: 42,298 acres

Description:

Includes all BLM lands located within the Medford District. See additional interim guidelines for that apply to all OHV emphasis areas within the district.

Limited Area Management Guidelines:

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and to passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.

- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicle use and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

Closed Area Management Guidelines:

- All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

Process for on-going public collaboration/outreach:

- The principle venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the main office illustrating designations, describing specific restrictions, and defining opportunities.

Process for selecting a final road and trail network:

Final route designations for the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

Road and trail construction and maintenance standards:

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.

Medford District OHV Emphasis Areas

The following interim management guidelines would apply to OHV emphasis areas on the Medford District if designated in the RMP revision.

Anderson Butte: 11,742 acres

Coyote Creek: 14,597 acres

East Howard: 6,812 acres

Elderberry Flats: 3,393 acres

Elliot Creek: 3,931 acres

Ferris Gulch: 2,222 acres

Illinois Valley: 4,681 acres

Lake Creek: 8,561 acres

Quartz Creek: 6,867 acres

Salt Creek: 4,692 acres

Spencer Creek: 7,468 acres

Timber Mountain/ Johns Peak: 16,375 acres

Worthington Road/Obenchain: 9,410 acres

Niche: These OHV emphasis areas offer a multiple-use trail riding experience for users of Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles. The transportation system of these areas also supports commercial and administrative access.

Management Guidelines:

- Paved roads are limited to licensed, street-legal vehicles only.
- Level 1 and 2 routes are open to Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles. Trails less than 50 inches wide are restricted to ATVs and motorcycles.
- ATVs and motorcycles must have valid Oregon ATV permits.
- Non-motorized travel is allowed on all access routes (e.g. horseback riding, hiking, and mountain biking) but is not encouraged due to potential conflicts and safety hazards.
- Motorized use on the road and trail system may be restricted during the summer due to fire hazard conditions.

Process for on-going public collaboration/outreach:

The principle venue for public collaboration within these emphasis areas is through local partnership relationships with local motorcycle and 4X4 associations.

Process for selecting a final road and trail network:

Criteria shall be established for future route designations. No route designations were made in the previous RMP planning effort.

Road and trail construction and maintenance standards:

Trail maintenance would be a priority within these OHV emphasis areas to ensure a quality riding experience for trail users, to minimize user conflicts, promote safety for users, and conserve natural resource values.

Klamath Falls Resource Area

OHV Designations:

Limited to designated roads and trails: 213,747 acres

Closed: 10,970 acres

Description:

Includes all BLM lands located within the Klamath Falls Resource Area.

Limited Area Management Guidelines:

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.



- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

Seasonal restrictions:

- The Eastside seasonal OHV closure is in effect from November 1 to April 15. Applies to all BLM lands located within deer winter range cooperative wildlife areas, including the majority of Stukel and Bryant Mountain and portions of the Gerber block as mapped.
- The Pokegema wildlife area seasonal OHV closure is in effect from November 20 to April 1.
- For designated snowmobile trails, wheeled vehicles are prohibited once grooming of trails begins for winter season.
- OHV use may be limited in other areas on a seasonal basis due to special conditions such as temporary fire restrictions, special wildlife requirements, etc.

Closed Area Management Guidelines:

- All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

Process for on-going public collaboration/outreach:

- The principle venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the main office illustrating designations, describing specific restrictions, and defining opportunities.
- BLM will continue to participate with other land managers in the cooperative management of the Pokegema wildlife area and deer winter range areas.

Process for selecting a final road and trail network:

Route designations have been completed for the New River ACEC and the Blue Ridge OHV Emphasis Area. Final route designations for the rest of the district will be accomplished in a comprehensive, interdisciplinary travel and

transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

Road and trail construction and maintenance standards:

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.

Planning Frameworks for Special Management Areas

This section presents district-specific management guidelines for management areas that would be carried forward under all three action alternatives. For a complete list of special recreation management areas, see the Tables section in Chapter 2. The management guidelines are presented in the order of Salem, Eugene, Roseburg, Coos Bay, Medford (the five western Oregon BLM districts), and Klamath Falls (one of the resource areas of the Lakeview District).

Salem District

Alsea Falls SRMA

Primary Market Strategy: Community

Niche: Overnight camping, picnicking, hiking and mountain biking, horse-back riding, and leisurely driving opportunities in a coastal mountain setting.

Management Objectives: Manage the area to provide overnight camping, hiking, mountain biking, and equestrian opportunities in a coastal mountain setting.

Targeted Outcomes:

Activities: Camping, hiking, picnicking, viewing natural landscapes, mountain biking, equestrian trail riding, and resting at a stop along a national backcountry byway

Experiences: Sense of achievement by developing personal skills and abilities; savoring the total sensory experience of a natural landscape; enjoying the closeness of family; relishing group affiliation and togetherness; bringing back pleasant memories; enjoying getting some needed physical exercise or rest; and escaping from personal-social, physical, or family pressures for awhile

Benefits: Improved mental health and health maintenance; restored body from fatigue, improved capacity for outdoor physical activity, improved fitness and health; greater family bonding, opportunity for a more well-rounded childhood development, enhanced lifestyle; and greater retention of distinctive natural landscape features

Prescribed Setting Character:

Physical: Primarily front country and middle country landscaping varies from un-modified forest to highly modified timber actions throughout the SRMA and along the byway

Social: Accommodates 16 families with up to 100 people in the campground and 22 families and up to 150 people in the picnic area when at full capacity. Encounters are highly expected during the high-use season. A group size of up to 10 in the rest of Alsea Falls Area SRMA with a less likelihood of encounters

Administrative: Brochures are available. Agency presence lessens as remoteness increases, mostly non-motorized recreation in and around the recreation site. The remaining SRMA is limited to mapped designated roads and trails. Resident summer staff and camp hosts during the open season. Site is closed during the low-use season of October through April, while allowing walk-in day use access during that time. Rules are clearly posted throughout the park.

Activity Planning Framework:

Management: Continue to provide for a developed camping and day use experience and associated facilities with an emphasis on maintaining a front and middle country recreation setting in the SRMA.

Marketing: Use information and interpretation to lessen visitor conflicts and resource impacts in the recreation area and SRMA.

Monitoring: Monitor visitor satisfaction.

Administrative: Apply administrative actions as needed to maintain safe and enjoyable recreation experience and to conserve and restore the natural setting.

Fishermen's Bend

Primary Market Strategy: Community

Niche: Offers a wide variety of safe and high-quality family and group facilities and outdoor recreational opportunities in a forested setting along the scenic North Santiam River, within 30 miles of larger rural communities and densely populated urban communities.

Management Objectives: To provide highly developed, clean, safe, enjoyable, and accessible facilities and outdoor recreation opportunities in a forested setting. To provide outdoor nature study programs and activities for children and adults.

Targeted Outcomes:

Activities: Individual and group camping and picnicking, non-motorized boating, fishing, nature study, water-play, biking, walking, and athletic field sports

Experiences: Enjoying closeness of family and friends and group affiliation and togetherness, enjoying easy access to natural landscapes, participating in outdoor events, getting some needed physical exercise, getting some needed physical rest, and releasing or reducing built-up mental tensions

Benefits: Improved mental health and health maintenance, stronger ties with family and friends, greater appreciation for parks and how managers care for them, and positive economic contribution to nearby rural communities

Prescribed Setting Character:

Physical: The overall physical setting is rural with a relatively natural appearing mature conifer forest setting along the scenic North Santiam River. The level of development and visitor amenities is high with paved roads, developed campsites (water, sewer and electrical hook-ups), cabins, flush restrooms with showers, accessible trails, and a boat ramp. Large group camping and picnic facilities are present with athletic fields, playgrounds, and basketball courts. Nature study facilities include a nature center and interpretive nature trail.

Social: High density with family, friends, and group interactions

Administrative: Park staff presence high with seasonal staff and volunteer hosts staying onsite and conducting frequent fee compliant checks and maintaining park facilities and cleanliness. Rules are clearly posted throughout site. Nature study programs and activities for both children and adults are provided on a weekly basis.

Activity Planning Framework:

Management: Continue to manage the park's facilities for a high level of facility maintenance, safety, cleanliness, and accessibility. To the extent possible, maintain the park's desirable mature forest and native vegetation. Expand site use for environmental educational activities, especially in the shoulder season.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue recreation staff/law enforcement patrols, resource monitoring, and seek input from visitors.

Administrative: To provide high-quality visitor service and to ensure compliance with park rules and resource protection, continue to use efficient mix of seasonal and volunteer staff to provide onsite management presence. To participate in partnerships that help meet management objectives.

Little North Santiam River

Primary Market Strategy: Community

Niche: Offers a wide variety of safe and high-quality outdoor recreational opportunities in a forested setting along the scenic Little North Santiam River, within 40 miles of larger rural communities and densely populated urban communities. Rugged and remote backcounty experiences are available in the Elkhorn Creek Wild and Scenic River (WSR).

Management Objectives: To provide a wide range of outdoor recreation opportunities and protect Elkhorn Creek WSR. To provide facilities, river access and administrative control that support resource protection, visitor safety, health, and enjoyment. To provide recreation visitor with education, information and interpretation designed to encourage stewardship and minimize user impacts and conflicts.

Targeted Outcomes:

Activities: Swimming, camping, picnicking, fishing, hiking, hunting, and recreational mining

Experiences: Enjoying closeness of family and friends and group affiliation and togetherness; enjoying easy access to natural landscapes, participating in outdoor events and getting some needed physical exercise; getting some needed physical rest and reducing built-up mental tensions; and enjoying more strenuous exercise and escaping crowds

Benefits: Improved mental health and health maintenance, stronger ties with family and friends, greater appreciation for parks and how managers care for them, personal growth and development with greater self-reliance associated with improved outdoor skills, and positive economic contribution to nearby rural communities

Prescribed Setting Character:

Physical: Modifications such as paved roads, utilities, houses, a golf course, and forest management are frequently observable along county roads and the Little North Santiam River. BLM lands along Elkhorn Creek WSR are much more rugged and remote with little to no observable modifications.

Social: Moderate to high levels of visitor interaction occurs in most of the SRMA with very low to no encounters expected along in the Elkhorn Creek WSR.

Administrative: Park staff presence high with seasonal staff and volunteer hosts staying onsite and conducting frequent fee compliant checks and maintaining park facilities and cleanliness. Rules are clearly posted in sites and areas. Much less agency presence and signage for Elkhorn Creek WSR.

Activity Planning Framework:

Management: Continue to manage park's facilities for a high level of facility maintenance, safety, cleanliness, and accessibility. To the extent possible, maintain desirable mature forest and native vegetation at parks.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue recreation staff/law enforcement patrols, resource monitoring, and seek input from visitors.

Administrative: Provide high-quality visitor service and to ensure compliance with park rules and resource protection, continue to use efficient mix of seasonal and volunteer staff to provide onsite management presence. Participate in partnerships that help meet management objectives.

Molalla River/Table Rock

Primary Market Strategy: Community

Niche: Offers a wide variety of settings and recreation activities within 10 miles of a large rural community and 60 miles of large urban populations. Uplands provide year round non-motorized trail opportunities and the Molalla River is popular for summer fishing, swimming, and rafting. Table Rock Wilderness (TRW) offers more remote opportunities with scenic overlooks, mountain meadows and forested non-motorized trails.

Management Objectives: To provide the facilities and visitors services needed for resource protection and a wide spectrum of outdoor recreational and nature study opportunities in a variety of natural settings from rural to primitive and social settings from highly interactive to more remote. To provide a variety of visitor information media and support to special events that promote "Leave No Trace" use practices, public land stewardship, and partnerships.

Targeted Outcomes:

Activities: Hiking, biking, equestrian use, camping, picnicking, swimming, fishing, boating, hunting, and natural resource education

Experiences: Enjoying closeness of family and friends and group affiliation and togetherness, enjoying having access to hands-on outdoor natural resource educational facilities and activities, and getting some needed physical rest and reducing built-up mental tensions and escaping everyday responsibilities for awhile in both developed and remote areas

Benefits: Improved mental health and health maintenance, stronger ties with family and friends; personal growth and development with greater self-reliance associated with improved outdoor skills, and positive economic contribution to nearby rural communities

Prescribed Setting Character:

Physical: The entire area is characterized by a forested setting of various ages. The Molalla River is more developed where timber management, roads, designated campsites, vaulted restrooms, and signs are frequently observable. Aquila Vista Environmental Education Site has trails, shelters, and a vaulted restroom for use in outdoor natural resource educational programs by schools and other groups. The uplands along the Molalla River are less developed with gravel roads and single-track trails and minimal signage and TRW more primitive with trailhead parking, signs, and single-track trails.

Social: Encounters with others along the Molalla River is more frequent and intensive than in the uplands along the trail system with the most remote area being within the wilderness.

Administrative: Regular patrols and visitor contact are made by agency recreation staff and law enforcement along the Molalla River with lower levels of agency presence in the uplands.

Activity Planning Framework:

Management: Continue to provide agency presence and facility management for resource protection and a variety of recreation opportunities. Consider new facility and program development as needed.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue recreation staff/law enforcement patrols, resource monitoring, and seek input from visitors.

Administrative: Complete a SRMA plan to help identify future facility and program needs. To participate in partnerships that help meet management objectives.

Nestucca River

Primary Market Strategy: Community

Niche: Developed overnight camping, water-based day use recreation, and scenic driving opportunities

Management Objectives: With increasing public use of the Nestucca River corridor, it is necessary to manage the recreation resource to not only accommodate increased use but to protect or enhance recreation, watershed, and wildlife values present.

Targeted Outcomes:

Activities: Camping, picnicking, swimming, fishing, and scenic driving

Experiences: Relaxation, family and group bonding, escape from personal and social pressures, and opportunity to enjoy the sights and sounds nature has to offer

Benefits: Personal – better mental health and health maintenance, and restored sense of self; Psycho-physiological – enhanced feeling of freedom and refinement; Household and Community – greater family bonding, opportunity for more well-rounded childhood development, learning and

passing on of outdoor skills, and fulfilling the desire of simple living; and
Economic – positive contribution to regional economic stability

Prescribed Setting Character:

Physical: Four semi-developed campgrounds. Three with paved roads and parking surfaces and one walk-in site. The campgrounds border the Nestucca River, which is a free-flowing State Scenic Waterway through the Oregon Coast Range. The Nestucca Back Country Byway parallels the river winding through steep canyon walls of the coast range. It is located within a mature forest dominated primarily by Douglas fir.

Social: Medium visitor density. The campgrounds are approximately 5 acres in size each and range between 5 and 11 sites per campground. The larger campgrounds at full capacity can accommodate 11 families.

Administrative: Self-service fee booth at information kiosk. Regularly patrolled during summer months by law enforcement and other agency staff. Rules are clearly posted at fee station/information kiosk.

Activity Planning Framework:

Management: Continue to provide for a semi-developed camping experience and associated facilities with an emphasis on maintaining a front country recreational setting.

Marketing: Use visitor information to disperse recreation use throughout the recreation season to reduce crowding during peak-use periods and enhance the overall visitor experience. Use information and interpretation to lessen visitor conflicts and resource impacts in the recreation area. Inform visitor how user fees are being used in the operation of the recreation area. Solicit feedback from users and user groups on how they would like to see their fees used in the future.

Monitoring: Monitor visitor satisfaction.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable recreation experience and to conserve and restore the natural environment (i.e., visitor services, law enforcement presence, restoration, permitting, and fees).

Sandy River/Mt. Hood Corridor

Primary Market Strategy: Destination

Niche: Only 40 miles from the Portland metropolitan area, this SRMA offers a scenic corridor with a unique mix of both high-quality developed recreation and interpretive facilities and river greenway open space. Key features include the Sandy and Salmon Wild and Scenic Rivers (WSR), Wildwood Recreation Site, and the Barlow National Historic Trail.

Management Objectives: At developed sites provide clean, safe, enjoyable, and accessible facilities and outdoor recreational opportunities in a forested setting, and in undeveloped areas provide less developed open space for a variety of outdoor recreation and nature study opportunities. To provide recreation visitor with education, information, and interpretation designed to encourage stewardship and minimize user impacts and conflicts.

Targeted Outcomes:

Activities: Hiking, swimming, biking, fishing, non-motorized boating, individual, nature study, picnicking, scenic driving, historic study, and hunting

Experiences: Enjoying closeness of family and friends and group affiliation and togetherness, enjoying easy access to natural landscapes and getting some needed to strenuous physical exercise, enjoying having access to hands-on outdoor natural resource educational facilities and activities, and getting some needed physical rest and reducing built-up mental tensions

Benefits: Improved mental health and health maintenance, stronger ties with family and friends, positive economic contribution to nearby rural communities

Prescribed Setting Character:

Physical: Modifications such as paved roads, utilities, houses, businesses, and some forest management are readily observable along U.S. Highway 26. Wildwood Recreation Site is a highly developed park located along the Salmon WSR in a forested setting that features an interpretive watershed and fisheries trail with a unique in-stream fish viewing window, an interpretive wetlands boardwalk, flush restrooms, and group facilities. The Sandy River and uplands offer less developed areas.

Social: Wildwood has more frequent and intensive interaction with some groups, while less developed areas along the Sandy River have less intensive interaction and may include low to moderate encounters with other visitors.

Administrative: Park staff presence high with seasonal staff and volunteer hosts staying onsite and conducting frequent fee compliant checks and maintaining park facilities and cleanliness. Rules are clearly posted in sites and areas.

Activity Planning Framework:

Management: Manage park facilities for a high level of facility maintenance, safety, cleanliness, and accessibility. To the extent possible, maintaining park's desirable mature forest and native vegetation. Continue to support environmental education activities. As needed, address management issues on less developed areas.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue recreation staff/law enforcement patrols and work with volunteers to meet resource monitoring needs and seek input from visitors.

Administrative: Complete an SRMA plan to help identify future facility and program needs. Participate in partnerships that help meet management objectives.

Yaquina Head Outstanding Natural Area

Primary Market Strategy: Destination

Niche: Access to a unique coastal headland setting with historic lighthouse and ocean front settings for traditional recreation uses, resource appreciation, education, and interpretation

Management Objectives: Promote the conservation and development of the area's scenic, natural, and cultural resource values; protect the area's wildlife habitat; and make use of the area for education, scientific study, and public recreation activities.

Targeted Outcomes:

Activities: Access to the ocean for bird watching, whale and harbor seal watching, nature study, tide pooling, visiting an historic lighthouse, hiking, interpretive programs, and environmental education

Experiences: Learning about and enjoying nature, enjoying the closeness of family, relishing group affiliation and togetherness, enjoying having easy access to natural landscapes, exercise and physical fitness, escaping everyday responsibilities for awhile, learning more about wildlife and the marine environment, and learning more about northwest coastal maritime history

Benefits: Improved mental health and health maintenance; personal development and growth; supporting a more outdoor-oriented lifestyle; improved opportunity to view wildlife; improved fitness and health; greater family bonding, more well-rounded child development, enhanced lifestyle, access to low cost recreation opportunities; positive contributions to local economic stability; and maintenance of distinctive recreation setting character, greater community ownership of recreation and natural, cultural and heritage resources, and greater protection of wildlife habitats

Prescribed Setting Character:

Physical: Developed recreation and interpretive site with paved roads and parking lot surfaces, a large interpretive center on a marine coastal headland. Landscape varies from ocean front beach and tide pool environment to unmodified coastal forest to urban park-like settings. The overall physical setting character is rural.

Social: High visitor density – approximately 340,000 visitors annually

Administrative: Controlled access entrance station. Patrolled daily by agency staff. Rules and regulations are clearly posted throughout the park. High presence of regulatory and interpretive signs. High degree of visitor control.

Activity Planning Framework:

Management: Continue to provide for a high-quality day use interpretive experience and maintain the associated facilities with an emphasis on maintaining a rural recreation setting.

Marketing: Use interpretation to increase visitor awareness of coastal marine wildlife habitat and maritime history, disperse use throughout the season to reduce crowding at peak periods to enhance the overall visitor experience and lessen visitor conflicts and resource impacts.

Monitoring: Monitor visitor satisfaction on a periodic basis to determine the appropriateness of management activities, signage, fees, etc.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable recreation experience and to conserve and restore the natural and historical setting.

Yellowstone

Primary Market Strategy: Community

Niche: Features the scenic Quartzville Creek Wild and Scenic River (WSR), which is easily accessed by the paved Quartzville National Back Country Byway (BCB) Road. A unique feature includes large stands of old-growth forest.

Management Objectives: To provide a wide range of outdoor recreation opportunities and protect Quartzville Creek WSR. To provide facilities, river access and administrative control that support resource protection, visitor safety, health, and enjoyment. To provide recreation visitor with education, information, and interpretation designed to encourage stewardship and minimize user impacts and conflicts.

Targeted Outcomes:

Activities: Hiking, biking, camping, picnicking, swimming, fishing, boating, hunting, scenic driving, recreational mining, and mining history

Experiences: Enjoying closeness of family and friends and group affiliation and togetherness and enjoying easy access to natural landscapes, enjoying having access to hands-on outdoor natural resource educational facilities and activities, getting some needed physical rest and reducing built-up mental tensions, and enjoying more strenuous exercise and exercise and escaping crowds

Benefits: Improved mental health and health maintenance, stronger ties with family and friends, personal growth and development with greater self-reliance associated with improved outdoor skills, and positive economic contribution to nearby rural communities

Prescribed Setting Character:

Physical: The entire area is characterized by a forested setting of various ages, but with old-growth forest dominating BLM lands. Lands along Quartzville Creek Wild and Scenic River are more developed, including three developed recreation sites and other modifications such as paved roads, designated river campsites, and visitor signs. The uplands in the northern part of the SRMA are less developed with gravel roads and very little evidence of human activities except past timber management activities.

Social: The social setting along Quartzville Creek has more frequent and intensive interaction with some group interaction, while the uplands have less intensive use and lower encounters.

Administrative: Regular patrols and visitor contact are made by agency recreation staff and law enforcement along the Quartzville Creek with low levels of agency presence in uplands.

Activity Planning Framework:

Management: Continue to manage recreation sites for a high level of facility maintenance, and sites and the corridor for visitor safety, cleanliness, and resource protection. To the extent possible, maintain desirable mature forest and native vegetation at parks.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue patrolling with recreation and law enforcement staff, continue monitoring resources, and continue seeking input from visitors.

Administrative: To provide high-quality visitor service and to ensure compliance with park and corridor rules and resource protection, continue to use efficient mix of seasonal and volunteer staff to provide park and corridor management presence. To participate in partnerships that help meet management objectives.

Eugene District

Lower Lake Creek

Primary Market Strategy: Destination

Niche: Opportunities for swimming and water play in a natural setting; hiking, mountain biking

Management Objectives: Improve visitor safety and decrease health hazards; enhance visitors' recreation experience and appreciation of natural resources.

Targeted Outcomes:

Activities:

- Water play, hiking, mountain biking, primitive camping

Experiences:

- Enjoy socializing with friends and families in a scenic area
- Physical activity (hiking and mountain biking) in a scenic area

Benefits:

- Relaxation, physical exertion; interaction with family and friends

Prescribed Setting Character:

Physical: Adjacent to a state highway; rustic amenities away from developed parking lot

Social: High levels of visitation; no possibility for solitude. Crowding expected on high-use weekends.

Administrative: Regulations posted; regular visitor services and law enforcement presence.

Activity Planning Framework:

Management: Continue to provide for improved visitor safety and health as described in the Lower Lake Creek RAMP (1997).

Marketing: Use information and interpretation to increase visitor awareness of safety and health issues in the SRMA.

Monitoring: Monitor visitor satisfaction.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable experience.

McKenzie River

Primary Market Strategy: Destination

Niche: Opportunities for nonmotorized boating, fishing, environmental education.

Management Objectives: Provide river-oriented recreation opportunities in coordination with other recreation providers along the river corridor.

Targeted Outcomes:

Activities: Fishing, boating, scenic viewing, resource interpretation

Experiences: Water-based physical activity in a roaded natural setting

Benefits: Outdoor skills development, exercise, relaxation, enjoyment of forested surroundings

Prescribed Setting Character:

Physical: Mostly natural appearing environment as viewed from sensitive roads and trails. Some obvious onsite controls of visitors. Access and travel is conventional motorized vehicles (e.g., sedans, RVs, etc.) and watercraft (primarily non-motorized).

Social: Visitor encounters common, but some chance for privacy

Administrative: Regular BLM staff patrols during high-use season (May-September). Interagency maintenance agreement continued to address routine maintenance needs of some developed sites.

Activity Planning Framework:

Management: Manage for continued water-based recreation activities. Incorporate interpretive/educational opportunities to strengthen visitor understanding and appreciation of the natural environment. Maintain river access opportunities.

Marketing: Continue to work with other agencies and private partners to promote responsible recreational use of the river corridor.

Monitoring: Monitor for visitor compliance, capacity and satisfaction. Draw upon university resources for periodic surveying.

Administrative: Provide visitor services and law enforcement presence.

Row River Trail

Primary Market Strategy: Destination

Niche: Opportunities for bicycle riding on paved trail, horseback riding

Management Objectives:

- Provide a broad spectrum of resource-dependent recreation opportunities to meet the needs and demands of public land visitors.
- Foster interagency efforts to improve service to the visiting public.
- Maintain high-quality recreation facilities to meet public needs and enhance the image of the agency.
- Improve public understanding and support of the Bureau by effectively communicating the agency's multiple use management programs to the recreation visitor.

Targeted Outcomes:

Activities: Bicycle riding, walking, horseback riding

Experiences: Physical activity in a rural setting

Benefits: Exercise, appreciation of natural surroundings, feelings of accomplishment

Prescribed Setting Character:

Physical: Rural—adjacent to heavily traveled paved county road

Social: Rural—small group size, but encounters with others are commonplace; traffic noise prevalent

Administrative: Rural—A substantial amount of information is provided along the trail; BLM presence daily during the high-use season.

Activity Planning Framework:

Management: Continue to provide hard-surface non-motorized riding opportunities; provide trailheads with parking lots and basic amenities. Provide interpretive signage along the trail.

Marketing: Include on printed and web-based media generated by BLM; work with partners to promote the trail.

Monitoring: Monitor for visitor compliance and satisfaction

Administrative: Provide visitor services and law enforcement presence. Maintain OHV closure on trail.

Shotgun Creek

Primary Market Strategy: Destination

Niche: Opportunities for organized group events, swimming, picnicking, and hiking.

Management Objectives:

- Provide resource-based, nonmotorized recreation activities.
- Promote organized group gatherings.
- Maintain facilities that offer convenience to visitors.
- Minimize visitor conflicts between groups.

Targeted Outcomes:

Activities: Group events, picnicking, hiking, competitive sport activities

Experiences: Physical activity, comport in a developed setting

Benefits: Exercise, companionship, appreciation of natural surroundings

Prescribed Setting Character:

Physical: Natural forested setting containing facilities/amenities typical of those found in urban recreation sites, including opportunities for competitive sporting events

Social: Small to large group accommodations offered. Opportunity to observe/affiliate with others.

Administrative: BLM staff and volunteer presence daily. Low cost/low maintenance fee collection procedures established.

Activity Planning Framework:

Management: Provide group event and nonmotorized trail opportunities

Marketing: Distribute print and internet-based media, partner with independent newspaper media to promote recreation site.

Monitoring: Monitor for visitor compliance and safety.

Administrative: Provide high level of visitor services from May-October; collect recreation use fees from May-October; maintain OHV closure; administer group shelter rental program.

Upper Lake Creek

Primary Market Strategy: Destination

Niche: Regionally important opportunities for fishing, horseback riding, camping, and nonmotorized boating

Management Objectives:

Roaded natural): Protect natural and scenic qualities of the SRMA around Hult Reservoir while allowing for rustic recreation facility development.

Semi-primitive motorized: Maintain existing semi-primitive setting, natural appearing environment, and allow for development of multiple use nonmotorized trails.

Targeted Outcomes:

Activities:

- Roaded natural: Fishing, camping, boating (lake), hiking, horseback riding
- Semi-primitive motorized: Hiking, horseback riding, OHV use on designated roads.

Experiences:

- Enjoyment of natural settings and scenic values Benefits:
- Offer comfort in an outdoor setting
- Improved health and safety of visitors
- Enhanced appreciation of natural settings

Prescribed Setting Character:

Physical: RN – adjacent to all-weather paved road, small dam, bridge, and fish ladder readily apparent. SPM – roads available for motorized vehicle use are generally graveled surface, relatively high density of roads.

Social: RN – relatively small group size, but mostly within sight and sound of others; high traffic level on paved road. SPM – small group size, less likely to encounter others.

Administrative: RN – rules posted; BLM presence on most summer weekends. SPM: occasional regulatory signage; some BLM presence.

Activity Planning Framework:

Management: Provide for rustic day use and overnight facilities as described in the Upper Lake Creek RMP (2005).

Marketing: Provide visitor use and experience opportunity information through a variety of media including web-based, brochures and onsite information.

Monitoring: Monitor visitor satisfaction.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable recreation experience and to conserve and restore the natural setting (e.g., visitor services, law enforcement, volunteer organizations for trail maintenance)

Roseburg District

Cow Creek

Primary Market Strategy: Destination

Niche: Back Country Byway; semi-developed day-use and river access; potential for overnight camping..

Management Objectives:

- Provide a broad spectrum of resource dependent recreation opportunities to meet the needs and demands of visitors as prescribed in the Cow Creek Rec. Area Management Plan.
- Withdraw developed sites from mineral entry. Monitor and deter vandalism.
- Operate in accord with adjacent landowners and manage backcountry byway.
- Develop camping opportunities within the scenic corridor, including the Island Recreation Site..

Targeted Outcomes:

Activities: Driving for pleasure, watchable wildlife, historical interpretation, camping, picnicking, recreational gold panning, other river activities, biking, and hiking.

Experiences: Group and family affiliations, escape from social pressure, physical exercise, developing outdoor skills, exploration and enjoying outdoor resources and viewsheds.

Benefits: Personal – Increased physical fitness, obtaining greater self confidence, savoring the senses of the natural environment, enjoying participation in desired activities in preferred outdoor setting, experiencing a greater sense of independence and exploration.

Psychological – Better mental health, reducing built up tensions, feeling of personal freedom and exhilaration, enjoying a risk taking adventure, improved outdoor skills.

Economic – Increased local tourism revenue, reduced health maintenance costs.

Environmental – Increased commitment to maintain quality natural, greater local community support to manage natural resources to be enjoyed by prosperity.

Prescribed Setting Character:

Physical: Varies from small developed recreation sites to natural areas of river and rolling forested hills. Landscaping varies from forest to managed park like environments. The overall physical setting character is rural.

Social: The social setting varies on three areas of the SRMA: 1) Cow Creek Back Country Byway – Moderate visitor density; 2) Cow Creek River – Low visitor density; 3) Developed recreation sites – Moderate visitor density during use season.

All settings are within a narrow corridor, but due to length, crowding seems diminished.

Administrative: The SRMA is mainly accessed from the south and north ends of the byway, however, other access points are available.

Activity Planning Framework:

Management: Provide for quality recreation settings and facilities to support a wide variety of recreation opportunities for preferred benefit outcomes. Strengthen partnerships with local and other federal agencies. Utilize volunteers. Maintain a middle country to rural recreation setting.

Marketing: Disseminate brochures, post information on the internet, and post news releases.

Monitoring: Conduct patrols to sites within the area. Collect visitor use statistics and user preferences. Perform safety inventories annually.

Administrative: Determine and apply administrative actions as needed to promote quality recreation experiences, protect the character of settings, minimize user conflicts, promote safety of visitors and protect the natural resources. Issue Special Recreation Permits.

North Umpqua

Primary Market Strategy: Destination

Niche: Developed overnight and day-use recreation; non-motorized river recreation, undeveloped non-motorized use area, and a paved access corridor.

Management Objectives:

- Enhance recreation opportunities through management plans, including: North Bank Ranch, North Umpqua Wild and Scenic River, and North Umpqua National Scenic Byway.
- Provide recreational opportunities compatible with the management of Columbia White Tail deer within the North Bank Habitat Management Area.
- Maintain high-quality recreation facilities to meet public needs and provide for quality recreation experiences in preferred settings. Withdraw developed sites from mineral entry.
- Coordinate volunteer host program and recreation partnerships with Umpqua National Forest.

Targeted Outcomes:

Activities: Camping, picnicking, hiking, wildlife viewing, rafting, kayaking, swimming, fishing, hunting, driving for pleasure, group gatherings, collecting forest products.

Experiences: Individual, family and group affiliations, escape from personal social pressure, achievement and challenge from adventure, physical exercise, enjoying outdoor resources.

Benefits: Personal – Increased physical fitness, learning outdoor skills, testing endurance, obtaining self confidence, experiencing a greater sense of independence and exploration.

Psychological – Better mental health, personal satisfaction achieved in outdoor quests, releasing or reducing built up tensions or stress, feeling of personal freedom and exhilaration.

Economic – Increased local tourism revenue, increased work productivity after experiences.

Environmental – Increased commitment to maintain quality natural settings for future recreation activities and opportunities, greater community support to manage natural resources.

Prescribed Setting Character:

Physical: Varies from developed recreation sites to natural areas of forested to semi-forested hills. The overall physical setting character is rural.

Social: 1) North Umpqua River – Low visitor density on W&SR section, high use in bait fishing area of Swiftwater; 2) North Umpqua Trail – Low visitor density; 3) North Umpqua Scenic Byway – High visitor density during summer use season; 4) Developed Recreation Sites – High visitor density during camping season; 5) North Bank Ranch – Low density.

Administrative: The entire area is accessed through specific areas where visitors can be monitored. Regular patrols and field presence are common. Rules are posted at sites. Brochures are available. Volunteer hosts reside seasonally or year round at seven sites.

Activity Planning Framework:

Management: Provide for quality recreation settings and facilities to support a wide variety of recreation opportunities. Strengthen partnerships. Utilize volunteers. Maintain rural setting.

Marketing: Disseminate brochures, post information on the internet, post news releases. Implement tourism actions from management plans of the byway and Wild and Scenic River.

Monitoring: Conduct regular field patrols. Collect visitor use statistics and preferences. Conduct safety inventories. Document river activities in the annual North Umpqua Wild & Scenic River Monitoring Report.

Administrative: Apply administrative actions to promote quality recreation, protect settings, minimize user conflicts, promote visitor safety, and protect natural resources. Partner with the Umpqua National Forest on management of the North Umpqua Wild and Scenic River and National Scenic Byway.

Umpqua

Primary Market Strategy: Community

Niche: Developed overnight and day-use recreation sites along river corridor

Management Objectives:

- Manage recreation use to protect natural resources, provide visitor safety, and minimize user conflicts. Withdraw developed sites from mineral entry.
- Maintain high-quality recreation facilities to meet public needs and provide for quality recreation experiences in a preferred setting.
- Cultivate quality volunteer hosts who provide service to users of recreation sites and river.

Targeted Outcomes:

Activities: Camping, picnicking, wildlife viewing, water play/swimming, fishing, driving for pleasure, viewing scenery, organized group gathering and socializing, off-highway vehicles.

Experiences: Individual, family and group affiliations, developing outdoor skills.

Benefits: Personal – Increased physical fitness, learning outdoor skills, testing endurance, obtaining self confidence, enjoying desired activities in preferred outdoor setting.

Psychological – Better mental health, personal satisfaction achieved in outdoor quests, releasing or reducing built up tensions or stress, feeling of personal freedom and exhilaration.

Economic – Increased local tourism revenue, reduced health maintenance costs.

Environmental – Increased commitment to maintain quality natural settings, greater local community support to manage natural resources.

Prescribed Setting Character:

Physical: Varies from highly developed recreation sites to forested areas. Landscaping includes managed park like environments. The overall physical setting character is rural.

Social: The social setting varies on three areas of the SRMA: 1) The Umpqua River – Low visitor density; 2) Developed recreation sites – High visitor density during camping season.

Administrative: Parts of the SRMA are accessed through areas where visitors can be monitored. Regular patrols are common. Rules are posted at sites and brochures are available. Volunteer hosts reside year-round at two recreation sites.

Activity Planning Framework:

Management: Provide for quality recreation settings and facilities to support a wide variety of recreation opportunities. Utilize volunteers. Maintain a rural recreation setting.

Marketing: Provide brochures, post information on the internet, and post news releases about recreation opportunities, rules, and special events.

Monitoring: Conduct patrols to use sites and collect use statistics and preferences. Perform safety inventories annually. Monitor volunteer efforts.

Administrative: Apply administrative actions as needed to promote quality recreation experiences, protect the character of settings, minimize user conflicts, promote safety of visitors and protect the natural resources. Issue Special Recreation Permits as needed.

Coos Bay District

Coos Bay Shorelands

Primary Market Strategy: Community

Niche: Access for ocean, coastal, and bay-front dependant recreation activities.

Management Objectives:

- Promote awareness of and appreciation for the many resource values and recreational opportunities, and support a minimum impact land use ethic through educational programs such as Leave No Trace and Tread Lightly.
- Manage the area to provide for a range of recreational opportunities that contribute to meeting recreation demand while protecting natural, cultural, and scenic resources.

- Provide and maintain visitor facilities, services, signage, and programs that are appropriate for the area's recreational opportunity setting that serves to protect the sensitive resources.

Targeted Outcomes:

Activities: Access to the ocean and bay for clamming, fishing, crabbing, boating, surfing, and wind sports. Four-wheel drive and off-highway vehicle touring, hunting, hiking, horseback-riding, mushroom hunting, bird watching, dispersed camping.

Experiences: Developing outdoor skills; experiencing a greater sense of independence, exploring, closeness of family, and group affiliation; easy access to natural landscapes; exercise and physical fitness; and an ability to utilize natural resources for personal enjoyment.

Benefits: Psychological – better mental health, personal development and growth, supporting an outdoor-oriented lifestyle, and greater freedom from urban living; Household and Community – greater family bonding, more well-rounded children, enhanced lifestyle, easy access to low-cost recreation opportunities; Economic – positive contributions to local economic stability, maintenance of community's distinctive recreation-tourism market, increased desirability as a place to live or retire; Environmental – maintenance of distinctive recreation setting character, greater community ownership of recreation and natural resources, greater protection of wildlife and plant habitats from growth and development.

Prescribed Setting Character:

Physical: Rural to front/middle country setting comprised of sand dune, wetlands, meadows, shore pine uplands, and bay/ocean front beaches. BLM's developed site includes a boat ramp, a parking lot, restrooms, interpretive kiosk, dock, and volunteer host site.

Social: Visitor encounters can be high during peak use periods at the boat ramp. Encounters diminish along the sand roads and are rare along the non-motorized trail system.

Administrative: Primarily in the form of fences, gates and posted regulatory signs. Patrolled frequently by BLM staff and county and BLM law enforcement officers.

Activity Planning Framework:

Management: Provide a range of opportunities that contribute to meeting recreation demand while protecting resources. Provide and maintain

visitor facilities, services, signage, and programs that are appropriate for the area's setting and serve to protect sensitive resources.

Marketing: Use information and education to lessen potential conflicts between visitors and manage impacts to natural, cultural and scenic resources.

Monitoring: Monitor visitor satisfaction and recreation-related resource impacts.

Administrative: Apply administrative actions to maintain a quality recreation experience.

Dean Creek Elk Viewing Area

Primary Market Strategy: Community

Niche: Unparalleled opportunities to view a Roosevelt elk herd in a day-use wildlife observation and interpretive site.

Management Objectives:

- Provide safe opportunities for the public to view and study elk, other wildlife and their habitats at Dean Creek.
- Provide high-quality forage for the elk as a means of maintaining herd health and supporting public viewing opportunities.
- Provide facilities and programs that support visitor safety; wildlife viewing; and interpretive, educational and passive recreational uses, all of which are compatible with the elk and other wildlife that inhabit Dean Creek.
- Manage visitor use to avoid unacceptable conflicts with, or damage to, wildlife and their habitats. Manage visitor use so elk and other wildlife retain their wild instincts and actions, by providing them freedom to roam the entire area without human intervention.

Targeted Outcomes:

Activities: Wildlife viewing, photography, interpretive and educational programs.

Experiences: Learning more about wildlife and wetlands, enjoy the experience of viewing an elk herd and natural landscapes, and physical rest

Benefits: Psychological – personal appreciation and satisfaction – closer relationship with the natural world, improved opportunity to view wildlife close-up; Economic – positive contributions to regional economic stability, increased local tourism revenue, maintenance of community's distinctive recreation-tourism character; Environmental – retention of rural landscape features, maintenance and enhancement of habitat for elk and other wildlife.

Prescribed Setting Character:

Physical: Developed wildlife viewing and interpretive site with paved road and parking lots, a large covered interpretive wayside and restrooms. Landscape is rural pastureland and tidally affected wetlands and forested islands on the banks of the Umpqua River.

Social: Visitors are confined to specified routes and viewing areas at Dean Creek, creating a setting with a high density of visitors, especially during peak use periods.

Administrative: Most of the property is closed to all public entry, except for the designated viewing areas. The area is regularly patrolled by law enforcement, BLM staff and volunteers. Fences and gates, posted rules, and no trespassing signs are common.

Activity Planning Framework:

Management: Continue to provide for a high-quality wildlife viewing and interpretive experience and maintain facilities with an emphasis on the rural recreation setting.

Marketing: Use information and interpretation to increase visitor awareness of wildlife habitat and wetland management. Work closely with the gateway community of Reedsport and other partners in the region in marketing and outreach.

Monitoring: Monitor visitor satisfaction and resource conditions based on stated objectives.

Administrative: Apply administrative actions to maintain a safe and enjoyable wildlife viewing experience while protecting the elk herd from harassment.

Loon Lake/East Shore

Primary Market Strategy: Destination

Niche: Developed overnight camping and access to water-based day use recreation.

Management Objective: Provide a clean, safe, enjoyable experience for visitors.

Targeted Outcomes:

Activities: Camping, picnicking, beach activities, access to power boating and interpretive programs.

Experiences: Family and group affiliation, physical rest, and to escape from personal-social pressures.

Benefits: Personal – Better mental health and health maintenance; Psycho-physiological - restored body from fatigue; Household and Community – greater family bonding, opportunity for more well-rounded childhood development; learning and passing on of outdoor skills, reduced social isolation; Economic – positive contribution to regional economic stability.

Prescribed Setting Character:

Physical: Developed recreation site with paved road and parking lot surfaces within a mature Douglas fir forest on the shore of a natural lake. Landscaping varies from unmodified forest to urban-like park settings. The overall physical setting character is rural.

Social: High visitor density – accommodates over 850 people within the developed 35 acre campground and day use area when at full capacity.

Administrative: Controlled access entrance station. Regularly patrolled by law enforcement and other agency staff. Resident staff during the summer recreation season. Rules are clearly posted throughout the park.

Activity Planning Framework:

Management: Continue to provide for a developed camping and day use experience and associated facilities with an emphasis on maintaining a rural recreation setting.

Marketing: Use visitor information and the reservation system to disperse use and reduce crowding during peak periods to enhance the overall visitor experience at Loon Lake. Use information and interpretation

to lessen visitor conflicts and resource impacts in the recreation area. Inform visitors how their fees are being used in the operation of the recreation area and solicit feedback from them on how they would like to see their fees used in the future.

Monitoring: Monitor visitor satisfaction and the natural setting values within the area.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable recreation experience and to conserve and restore the natural setting at Loon Lake (i.e., permits and fees, visitor services, law enforcement, restoration/renovation).

New River

Primary Market Strategy: Community

Niche: Opportunities to explore undeveloped coastal uplands, river and ocean-front settings for traditional recreation uses, resource appreciation, and educational and interpretive programs.

Management Objectives:

- Accommodate low-impact recreational use at New River while providing a variety of experience opportunities to help meet existing and anticipated demands.
- Promote awareness and appreciation for New River's many resource values, especially those significant to its Area of Critical Environmental Concern designation.
- Provide adequate supervision, visitor facilities, services, signage, and programs to protect resources and support planned visitor use activities and levels.
- Provide reasonable access with minimal impact on resources and visitor experiences.

Targeted Outcomes:

Activities: Access to the ocean and river for fishing, waterfowl hunting, and kayaking, hiking, bird watching, photography, nature study, interpretive programs and environmental education.

Experiences: Learning about and enjoy nature; developing outdoor skills; experiencing independence, enjoying the closeness of family, group affiliation, exercise; escape pressures.

Benefits: Psychological – personal development and growth, supporting an outdoor-oriented lifestyle, improved opportunity to view wildlife,

greater freedom from urban living; Household and Community – greater family bonding, more well-rounded children, enhanced lifestyle, access to low cost recreation opportunities; Economic –contributions to local economic stability, maintenance of community's distinctive recreation-tourism market niche, increased desirability as a place to live, increased property values for adjacent land owners; Environmental – maintenance of distinctive recreation setting, greater community ownership of recreation and natural resources, greater protection of habitats from development.

Prescribed Setting Character:

Physical: Primarily a rural to front/middle country setting that includes diverse coastal habitats, sand dunes and ocean-front beaches. Facilities at Storm Ranch include a learning center, parking lots, restrooms, interpretive kiosk, picnic tables and a host site.

Social: Visitor encounters are highest (10-20 contacts) during peak use periods at Storm Ranch and Floras Lake. Encounters diminish significantly on the trail network and river.

Administrative: Primarily in the form of gates and posted regulatory signs. Area is closed to the public at night. Patrolled frequently by BLM staff and law enforcement. Interpretive and environmental education programs are used to increase awareness and to lessen impacts.

Activity Planning Framework:

Management: Provide opportunities that contribute to meeting recreation demand while protecting resources. Provide and maintain visitor facilities, services, signage, and programs.

Marketing: Use information and education to lessen potential visitor conflicts and resource impacts. Exercise discretion in promoting the recreation opportunities to minimize crowding.

Monitoring: Monitor visitor satisfaction and recreation-related resource impacts.

Administrative Apply administrative actions to maintain a quality recreation experience compatible with the appropriate setting and to protect sensitive resources.

Sixes River

Primary Market Strategy: Destination

Niche: Developed camping, water based day-use activities, and recreational gold mining.

Management Objectives:

- Provide the facilities, services and administrative designations needed to manage the activities associated with recreational use.
- Manage the existing recreation sites consistent with Roaded Natural to Roaded Modified management classes. Continue to provide for a range of recreation opportunities in the area, including individual to large-sized group camping and picnicking experiences within the Edson Creek Recreation Site.

Targeted Outcomes:

Activities: Camping, picnicking, fishing, social gatherings, swimming, non-motorized boating, recreational gold panning and sluicing.

Experiences: Family and group affiliation; physical rest; escape from personal-social pressures; ability to collect and utilize natural resources for personal enjoyment (e.g., fishing and recreational mining).

Benefits: Personal - better mental health and health maintenance, greater self reliance, stronger ties with family and friends; Psycho-physiological - restored body from fatigue; Household and Community - greater family bonding, opportunity for more well-rounded childhood development, learning and passing on of outdoor skills, reduced social isolation; Economic - positive contribution to regional economic stability.

Prescribed Setting Character:

Physical: Developed recreation sites along the banks of the Sixes River, varying from an unmodified alder and Douglas fir forest to a rural park setting.

Social: High visitor density in the developed campgrounds when operating at peak capacity. During the off-season visitor contacts can be less than 10 per day.

Administrative: Regularly patrolled by law enforcement and other agency staff. Both campgrounds are fee areas and rules are clearly posted throughout the recreation area.

Activity Planning Framework:

Management: Continue to provide for a developed camping and day use experience and associated facilities with an emphasis on maintaining a rural recreation setting.

Marketing: Use information and interpretation to lessen visitor conflicts and resource impacts in the recreation area. Inform visitors how fees are being used in the operation of the recreation area and solicit feedback from them on how they would like to see their fees used in the future.

Monitoring: Monitor visitor satisfaction and recreation-related resource impacts based on the SRMA objectives.

Administrative: Apply administrative actions to maintain a safe and enjoyable recreation experience and to conserve and restore the natural setting of the Sixes River (e.g., permits and fees, visitor services, law enforcement, restoration/renovation).

Tioga

Primary Market Strategy: Undeveloped

Niche: Undeveloped Coast Range setting for traditional forest-based recreation activities.

Management Objectives: An SRMA management plan has not been developed to establish management objectives for this area.

Targeted Outcomes:

Activities: Driving for pleasure, big game hunting, fishing, mushroom gathering, camping in developed campgrounds, primitive dispersed camping, hiking, mountain biking/bicycling.

Experiences: Developing skills and abilities; experiencing a greater independence, exploring, enjoying nature, utilize resources for personal enjoyment, physical fitness; escape pressures.

Benefits: Psychological – better mental health, personal development and growth, greater self reliance, improved outdoor skills and self confidence, stronger ties with family, friends, and the natural world, a more outdoor-oriented lifestyle, enhanced sense of personal freedom; Psycho-physiological – improved physical fitness and health, restored body from fatigue;

Household and Community – greater family bonding, reduced social isolation, passing on outdoor skills and values, more well-rounded children, enhanced lifestyle; Economic – access to low cost outdoor recreation experiences, positive contribution to local economic stability, maintenance of the region's distinctive recreation market niche and character

Prescribed Setting Character:

Physical: Developed recreation sites include: Park Creek Campground, Burnt Mountain Recreation Site, and the Doerner Fir Trail. The area contains tracts of substantially unmodified forest landscapes in the Cherry Creek Research Natural Area and Wilderness Instant Study Area, the Tioga Creek Area of Critical Environmental Concern and the China Wall Area of Critical Environmental Concern.

Social: Social encounters are very low except the Park Creek Campground during the peak of summer and fall hunting season. Visitors may encounter log trucks on the roadways and other activities commonly associated with commercial forestry practices on public and private land.

Administrative: Very few administrative controls except for gates and some regulatory signs. Infrequent patrol by law enforcement and other BLM employees involved in visitor services.

Activity Planning Framework:

Management: Provide a developed camping experience at Park Creek and associated facilities with an emphasis on maintaining a front country recreation setting. Maintain existing trails and evaluate the conversion of closed roads for additional hiking, mountain biking, equestrian, and ohh-highway vehicle opportunities. Develop new trails to connect with existing opportunities in the area.

Marketing: Use information and interpretation to lessen visitor conflicts and resource impacts with an emphasis on low impact recreation practices. Provide information to visitors about forest management practices, stream restoration and wildlife habitat management efforts.

Monitoring: Monitor visitor satisfaction and recreation-related resource impacts.

Administrative: Apply administrative actions to maintain a safe and enjoyable recreation experience within the Park Creek Campground and to conserve the middle country and backcountry settings of the area. Keep administrative controls to the minimum necessary to meet objectives in order to preserve the primitive setting valued by visitors.

Medford District

Hyatt Lake-Howard Prairie Lake

Primary Market Strategy: Destination

Niche: Sub-alpine plateau featuring two lakes adjacent to the Cascade/ Siskiyou National Monument.

Management Objectives: Address Special Recreation Management Area issues and prioritize projects in watershed analyses or separate recreation area management plans as appropriate. Prepare project plans as needed. Provide for water-based recreation opportunities, winter sports, hiking, camping, equestrian use, fishing, and sightseeing.

Targeted Outcomes:

Activities: Camping, fishing, swimming, hiking, winter sports, equestrian use, wildlife observation, and nature interpretation.

Experiences: Escape personal or social pressures. Relaxation in a forested mountain setting. Enjoy the company of family and friends, the use of recreation equipment, and exercising.

Benefits: Restored mind from unwanted stress; improved mental well being; improved skills for outdoor enjoyment; stronger ties to family and friends.

Prescribed Setting Character:

Physical: Sub-alpine forested plateau featuring two lakes with excellent fisheries, boating opportunities, hiking opportunities, and scenic vistas. The area is of a semi-developed rural character and is accessible by county roads, state highways, and BLM roads.

Social: Moderate to high visitor density during peak use periods. Off-season periods offer opportunities for solitude, especially in undeveloped areas suitable for dispersed recreation. Campgrounds are generally full on weekends with much interaction between camping groups and BLM personnel.

Administrative: Most campgrounds have controlled access entrance stations with no reservations. County, state, and BLM law enforcement patrol periodically. Campground hosts provide visitor services.

Land ownership is mixed between county, state, private, and BLM.

Activity Planning Framework:

Management: Provide the widest array of recreation opportunities available in a forest, lake, mountain, and trail environment. Provide for winter sports opportunities. Emphasize camping and water based recreation.

Marketing: This SRMA markets itself and is a perennial favorite destination for the local population of the Rogue Basin and Klamath Basin. BLM and Jackson County distribute brochures and literature describing the attractions of the area.

Monitoring: During peak use periods, agency staff perform daily monitoring in high-use density areas, providing visitor services and noting and mitigating any resource damage. Periodic customer satisfaction surveys are conducted.

Administrative: On BLM lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with county and private landowners to preserve and maintain the natural character of the area.

Pacific Crest National Scenic Trail

Primary Market Strategy: National strategy for long-distance hikers, local strategy for short-distance hikers and equestrian users

Niche: This 40-mile portion of the trail offers high elevation hiking and outstanding opportunities for solitude and primitive camping along the Cascade-Siskiyou Mountains.

Management Objectives: Protect and preserve the physical, aesthetic, social and biological environments characteristic within the trail corridor. Provide interpretive information at all access points. Maintain trail conditions as prescribed by BLM standards. Cooperate with trail groups, other agencies, and private landowners in the overall management of the trail.

Targeted Outcomes:

Activities: Long distance and day hiking, equestrian use, photography, wildlife observation, sightseeing, camping, hunting, and cross-country jogging.

Experiences: Solitude and self reliance. Escape stress and pressure of the outside world. Enjoy physical exercise, challenge, and adventure of long distance wilderness hiking.

Benefits: Development of improved physical endurance. A restored mind from unwanted stress. Enhanced awareness of nature and natural processes.

Prescribed Setting Character:

Physical: The trail corridor is generally within a short distance of the ridge crest and proceeds below timberline through coniferous forest stands, abbreviated by occasional meadows. Water sources are generally uncommon. Frequent encounters with grazing livestock.

Social: Encounters with other hikers and equestrian riders are nominal away from trailheads.

Administrative: The trail passes through federal, state, county, and private lands. BLM's dominant management role is apparent to hikers as all signage is BLM produced. Law enforcement presence is negligible with the exception of very infrequent patrols.

Activity Planning Framework:

Management: Continue to monitor use patterns to detect trends and predict changes. Practice adaptive management techniques to react to changing conditions and user needs.

Marketing: Information provided at trailheads, road crossings, or at agency offices provides the user with a description of features along the trail, adjacent recreation opportunities, and information on the differing types of uses a hiker may encounter. Maintain an updated agency webpage covering trail conditions, attractions, available resources and their location. Cooperate with trail groups, managing agencies, and landowners to promote proper use.

Monitoring: Use passive electronic trail counters for visitor use information. Provide comment and message journals at trailheads. Through the trail website, encourage and request users to contact BLM and offer assessments as to trail conditions or other observations. When possible, utilize BLM staff, or volunteers to conduct foot patrols.

Administrative: Assume a proactive role in trail management, obviating any problems or conditions before any degradation of the recreation resource occurs. Use appropriate signage to alert hikers of land ownership, jurisdictional boundaries, use regulations, and emergency services.

Rogue National Wild and Scenic River

Primary Market Strategy:
Employ a nationally based destination marketing strategy

Niche: The Rogue River is renowned for its broad array of outstandingly remarkable values: superior fisheries, outstanding scenery, challenging white water, and historical significance all combine to make the Rogue stand out as a nationally significant component of the National Wild and Scenic Rivers System.

Management Objectives: Manage the designated portion of the Rogue River to protect its outstandingly remarkable values.

Targeted Outcomes:

Activities: Motorized and non-motorized white water boating, camping, fishing, swimming, hiking, photography, wildlife observation, and tributary exploration.

Experiences: Family and group affiliation, physical rest, escape from personal and social pressures, experience a risk activity, develop outdoor skills, develop nautical skills, appreciate natural wonders, and enjoyment of a relatively natural and undisturbed environment.

Benefits: Better mental health, restored mind from unwanted stress, greater self reliance, improve skills for outdoor enjoyment, and enhanced awareness and understanding of nature.

Prescribed Setting Character:

Physical: Within the designated "Wild" section of the river, visitors experience a primitive and relatively undeveloped coastal confluence river corridor with challenging rapids requiring advanced boating skills. Within the designated "Recreation" section, visitors experience a semi-developed shoreline with adjacent roads and dwellings, flatter terrain, and slow water.

Social: Within the designated "Wild" river classification, visitors encounter mostly non-motorized boating groups and shore-side campers. Encounters with others are sporadic with long time periods between contacts. Within the designated "Recreation" section, motorized tour boats are common and the dominant conveyance for visitors.

Administrative: BLM, state, and county jurisdictions overlap along the entire river stretch. BLM has the dominant role in administrative presence. Regular river maintenance and permit compliance trips are performed by BLM staff. County marine deputies provide the majority of law enforcement services. BLM manages 47 miles of the river's 84-mile long designated length. The 33-mile "Wild" section is under a limited entry permit system, allowing approximately 120 people per day to proceed down river from Grave Creek to Watson Creek. Private party permits are obtained through a lottery conducted yearly. Commercial parties are allocated approximately half of these spaces based on historic use levels.

Activity Planning Framework:

Management: Manage the entire designated BLM portion according to management plans.

Marketing: The Rogue enjoys a national reputation for its outstanding qualities. An active website is maintained to educate potential visitors regarding the opportunities.

Monitoring: Visitor numbers, types of uses, physical, social and biological resource conditions are monitored according to the prescriptive measures outlined in the river's management plans.

Administrative: Adaptive management is applied as necessary to ensure that the river's outstandingly remarkable values are either maintained or enhanced.

Klamath Falls Resource Area

Gerber

Primary Market Strategy: Community

Niche: Provide opportunities for roaded natural and semi-primitive recreation experiences.

Management Objectives: Manage Gerber Recreation site with camping units to accommodate overnight, day use and mobility impaired visitors; Frog camp day use area; and boat ramps. Manage several nearby semi-developed camp sites to provide primitive camping and day use. Manage and maintain the Gerber Watchable Wildlife Area Tour. In addition, develop or enhance watchable wildlife and other interpretive sites to showcase resource management. Manage area for roaded natural and semi-primitive recreation opportunities.

Targeted Outcomes:

Activities: Camping, fishing, wildlife viewing, hunting, OHV driving

Experiences: Opportunities for solitude, achievement/stimulation, enjoying nature

Benefits: Greater self-reliance, improved outdoor skills, greater sense of adventure, physical fitness

Prescribed Setting Character:

Physical: Provide roaded natural and semi-primitive recreation experiences.

Social: Low (6 to 10 parties per day) to moderate (10 to 50 parties per day) recreation use levels (moderate near developed sites and roads, and low to moderate in other areas).

Administrative: Onsite regimentation and controls present, but are subtle. Camp hosts provided at Gerber Recreation site (fee site).

Activity Planning Framework:

Management: Facilities include developed and semi-developed campgrounds, day use areas, boat ramps, hiking trail, Watchable Wildlife and Klamath Basin Birding Trail viewing site. Seasonal road closure in Gerber Block from November 1 to April 15.

Marketing: New brochure has been developed. Area is identified on Klamath Basin Birding Trail map.

Possible enhancement measures include additional interpretive panels and sign.

Monitoring: Area is OHV limited to existing roads, with additional seasonal road closures in place. Miller Creek ACEC, Gerber Reservoir, Willow Valley Reservoir and several streams are closed to OHV use. Limited onsite administration (except at Gerber Recreation site where camp hosts are provided)

Administrative: Limited onsite administration, primarily at Gerber Recreation site and during regular patrols and law enforcement.



Hamaker Mountain

Primary Market Strategy: Community

Niche: Roaded natural recreation opportunities, including mountain biking, hiking, OHV, competitive hill climbs and winter sports within the Klamath Falls urban area.

Management Objectives: Manage SRMA for Roaded Natural recreation opportunities. Design timber management and other activities to enhance future trail and site development with an emphasis on winter sports and mountain biking. Examples of timber management activities that would enhance recreation would include the development of cleared trails suitable for downhill or cross country skiing. Trails would be replanted with vegetation to benefit wildlife and would be unavailable for future timber harvest. The identification and resolving of specific recreation management issues and prioritization of projects (developed parking areas, designated trails, etc.) will occur during watershed analysis (completed) or recreation area planning. Establish a BLM patrol during winter months to provide visitor assistance on Hamaker Mountain. Coordinate with Federal Aviation Administration (FAA) on access road plowing, maintenance, improvements. Winter recreation opportunities limited if road is not regularly plowed by FAA.

Targeted Outcomes:

Activities: Winter sports, mountain biking, hiking, OHV trail riding, competitive events

Experiences: Exercise, Escape physical pressure, enjoying nature

Benefits: Greater self-reliance, improved outdoor skills, greater sense of adventure, physical fitness. Close to urban area recreation opportunities.

Prescribed Setting Character:

Physical: Roaded natural opportunities.

Social: About equal opportunities for affiliation with other user groups and for isolation from sights and sounds of man. Concentrations of users are low to moderate.

Administrative: Onsite controls and restrictions offer a sense of security. Rustic facilities provided.

Activity Planning Framework:

Management: No facilities currently provided. New facilities to include trailheads, designated OHV routes, developed trails, group use areas and winter sports trails and parking areas. Seasonal fire restrictions limit OHV use. Opportunity to tie-in with Klamath Sportsman's Park.

Marketing: New brochure to be developed once facilities are developed and needed easements are in place. Opportunities for concession for permitted travel/shuttle service.

Monitoring: Ongoing monitoring to be conducted during spring through fall months to monitor use, facility conditions and reduce user conflicts. Monitoring of winter use when snow is adequate for recreation activities.

Administrative: OHV use limited to existing roads (existing condition). OHV use is to be limited to designated trails once OHV inventory is completed. Limited onsite administration, primarily patrols and law enforcement. ATV allocation committee grants to be pursued for facility development and law enforcement.

Pacific Crest National Scenic Trail

Primary Market Strategy: Destination.

Niche: This 0.5-mile portion of the trail offers high elevation hiking and outstanding opportunities for solitude and primitive camping along the Cascade-Siskiyou Mountains.

Management Objectives: Protect and preserve the physical, aesthetic, social and biological environments characteristic within the trail corridor. Provide interpretive information at all access points. Maintain trail conditions as prescribed by BLM standards. Cooperate with trail groups, other agencies, and private landowners in the overall management of the trail.

Targeted Outcomes:

Activities: Long distance and day hiking, equestrian use, photography, wildlife observation, sightseeing, camping, hunting, and cross-country jogging.

Experiences: Solitude and self reliance. Escape stress and pressure of the outside world. Enjoy physical exercise, challenge, and adventure of long distance wilderness hiking.

Benefits: Development of improved physical endurance. A restored mind from unwanted stress. Enhanced awareness of nature and natural processes.

Prescribed Setting Character:

Physical: The trail corridor is generally within a short distance of the ridge crest and proceeds below timberline through coniferous forest stands, abbreviated by occasional meadows. Water sources are generally uncommon. Frequent encounters with grazing livestock.

Social: Encounters with other hikers and equestrian riders are nominal away from trailheads.

Administrative: The trail passes through federal, state, county, and private lands. BLM's dominant management role is apparent to hikers as all signage is BLM produced. Law enforcement presence is negligible with the exception of very infrequent patrols.

Activity Planning Framework:

Management: Maintenance for the Klamath Falls Resource Area section of the trail is coordinated by the Medford District BLM. Monitor use patterns to detect trends and predict changes. Practice adaptive management to react to changing conditions and user needs.

Marketing: Information provided at trailheads, road crossings, or at agency offices provides the user with a description of features along the trail, adjacent recreation opportunities, and information on the differing types of uses a hiker may encounter. Maintain an updated agency webpage covering trail conditions, attractions, available resources and their location. Cooperate with trail groups, managing agencies, and landowners to promote proper use.

Monitoring: Use passive electronic trail counters for visitor use information. Provide comment and message journals at trailheads. Through the trail website, encourage and request users to contact BLM and offer assessments as to trail conditions or other observations. When possible, utilize BLM staff, or volunteers to conduct foot patrols.

Administrative: Assume a proactive role in trail management, obviating any problems or conditions before any degradation of the recreation resource occurs. Use appropriate signage to alert hikers of land ownership, jurisdictional boundaries, use regulations, and emergency services.

Stukel Mountain

Primary Market Strategy: Community

Niche: Semi-primitive motorized and non-motorized trail opportunities within the Klamath Falls urban area. Includes proposed hiking, horseback, mountain biking, and OHV trail opportunities; and hang gliding launch area.

Management Objectives: Manage SRMA for semi-primitive motorized and non-motorized recreation opportunities. The identification and resolving of specific recreation management issues and prioritization of projects (designated off-highway vehicle trails, ease of public access, developed recreation sites, etc.) will occur during watershed analysis or recreation area planning. Improve main road access. Consider development of hang gliding and other facilities for day use and overnight camping. Improve legal access through easements.

Targeted Outcomes:

Activities: Hiking, mountain biking, horseback riding, OHV tour routes

Experiences: Exercise, Escape physical pressure, enjoying nature

Benefits: Greater self-reliance, improved outdoor skills, greater sense of adventure, physical fitness

Prescribed Setting Character:

Physical: Semi-primitive motorized and non-motorized opportunities

Social: Concentrations of users is low except on weekends where it is moderate

Administrative: Onsite regimentation and controls present, but are subtle

Activity Planning Framework:

Management: No facilities currently provided. New facilities to include trailheads, designated OHV routes, developed trails, camping areas and hang gliding. Seasonal road closure from Nov. 1 to April 15.

Marketing: New brochure to be developed once facilities are developed and needed easements are in place.

Monitoring: Ongoing monitoring to be conducted during spring through fall months to monitor use, facility conditions and reduce user conflicts.

Administrative: Limited onsite administration, primarily patrols and law enforcement.

Upper Klamath River

Primary Market Strategy: Destination recreation tourism.

Niche: Outstanding summer whitewater boating, fishing and camping opportunities.

Management Objectives: Manage for semi-primitive motorized recreation objectives. Manage the area to emphasize whitewater boating, fishing and camping along the upper Klamath River. Improve and expand Stateline take-out, scouting trails for the Caldera and Hell's Corner rapids. Manage and maintain Topsy recreation site with camping units for overnight and day use visitors, boat ramp, the Spring Island rafting launch site, and several primitive camping sites along the Klamath River. Continue to follow the cooperative management agreement with the Pacific Power and Light Company for coordinated recreation trail and facility development. Nominate Topsy Road to the National Back Country Byway System. Maintain the Klamath River edge trail for non-motorized use.

Targeted Outcomes:

Activities: Whitewater boating, fishing, camping, off-highway vehicle driving, sightseeing

Experiences: Risk taking, opportunities for solitude, achievement/ stimulation, enjoying nature

Benefits: Greater self-reliance, improved outdoor skills, greater sense of adventure

Prescribed Setting Character:

Physical: Semi-primitive motorized

Social: Low to moderate interaction, (less on weekdays, moderate on weekends)

Administrative: Onsite regimentation and controls present but subtle

Activity Planning Framework:

Management: Facility development includes existing facilities (Topsy, Spring Island, Klamath River campground, Stateline, and dispersed camps), Future facilities include Bypass reach parking areas, boat launch and access trails, additional trails connecting Topsy campground with Copco village and Keno dam area.

Marketing: New brochure to be developed in conjunction with statewide developed facility brochure marketing. Other marketing done by commercial outfitters.

Monitoring: Ongoing monitoring for Wild and Scenic River and outfitter/guides to be done by primarily during the summer whitewater boating season.

Administrative: Limited onsite administration, primarily at Topsy campground, Spring Island boat launch and during regular seasonal patrols.

Wood River Wetland

Primary Market Strategy: Community

Niche: Provide opportunities for roaded natural and semi-primitive recreation experiences.

Management Objectives: Provide opportunities for roaded natural and semi-primitive recreation experiences (opportunities to have a high degree of interaction with the natural environment; to have moderate challenge and risk and to use outdoor skills). See Wood River RMP/EIS for additional management objectives and detailed guidance.

Targeted Outcomes:

Activities: Wildlife viewing, hiking, fishing, hunting, boating, dog walking.

Experiences: Exercise, Escape physical pressure, enjoying nature

Benefits: Greater self-reliance, improved outdoor skills, greater sense of adventure, physical fitness, rural recreation.

Prescribed Setting Character:

Physical: Provide roaded natural and semi-primitive recreation experiences.



Social: Low (6 to 10 parties per day) to moderate (10 to 50 parties per day) recreation use levels (moderate near developed sites and roads, and low to moderate in other areas).

Administrative: To manage the area for day use only. Recreation use and facilities would be secondary to the overall objective of wetland restoration and water quality improvement.

Activity Planning Framework:

Management: Facilities include a paved parking area, canoe/small boat launch, vault toilets, hiking trail, interpretive panels. Area closed to motorized use, and additional use restrictions (time of day, personal belongings, etc.).

Marketing: New brochure has been developed. Day use facilities and trail are developed as well as interpretive panels. Future development includes additional wetland and nature trails and environmental education gathering area. Area is identified as a site on the Klamath Basin Birding Trail map and is used for environmental and classroom education.

Monitoring: Area has a self-registration form, and additional monitoring occurs throughout the year by BLM staff and volunteers.

Administrative: Area is OHV closed (except for administrative uses), closed to overnight use, area open to hunting. Limited onsite administration, primarily patrols and law enforcement.



Appendix K. Wilderness Characteristics

This appendix provides background on the Evaluation and Planning Process for lands with wilderness characteristics.

In this appendix:

Wilderness Characteristics Analysis 1257

Wilderness Characteristics Analysis

Introduction

BLM has developed an evaluation and planning process to consider wilderness characteristics during the western Oregon plan revisions. This process has been designed to: (1) review original wilderness inventories conducted by BLM between 1978 and 1980 to ensure current and accurate information exists to analyze the environmental impacts of alternatives on BLM lands with wilderness characteristics; and (2) address proposals from the public to inventory and protect BLM lands with wilderness characteristics.

BLM's authority to conduct wilderness reviews, including the establishment of new wilderness study areas, expired on October 21, 1993, pursuant to Section 603 of FLPMA. However, BLM has retained authority under Section 201 of FLPMA to inventory wilderness characteristics and to consider such information during land use planning. Through this planning process, BLM has discretion to determine which portions of BLM lands with wilderness characteristics would be protected under special management. However, BLM can not manage these areas under the non-impairment standard described in BLM's Interim Management Policy for Lands Under Wilderness Review (Handbook H-8550-1) which applies only to wilderness study areas.

BLM received scoping comments from the public to inventory and protect wilderness characteristics on specific BLM lands in western Oregon (hereinafter referred to as "public wilderness proposals"). These requests have been considered along with all other resource information during this land use planning process.

Protection of wilderness characteristics on O&C lands determined to be suitable for permanent timber production is considered to be inconsistent with the O&C Act. Information about the presence or absence of wilderness characteristics on these lands, therefore, is not necessary to make land use plan decisions. However, BLM has determined where O&C lands suitable for permanent timber production overlap public wilderness proposals in order to analyze how wilderness characteristics, if present, would be affected by each alternative.

Wilderness characteristics include: naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive and unconfined recreation. These characteristics must be present in a roadless area of at least 5,000 acres or a smaller roadless area that is of sufficient size to make practical its preservation in an unimpaired condition. A consideration used in this evaluation process is when a smaller BLM roadless area adjoins an identified roadless area of the U.S. Forest Service, and their combined acreage is a minimum 5,000 acres. In this situation, a determination has been made whether or not the BLM portion contains wilderness characteristics when considered in context with the U.S. Forest Service portion.

The size of the roadless area is a critical factor in the determination of the presence or absence of individual wilderness characteristics. If the size requirement is not met, then the area cannot be considered to possess wilderness characteristics, since such characteristics are dependent on the sufficient size of the roadless area. Wilderness characteristics within areas of sufficient size are defined as follows:

Naturalness. Naturalness is present within an area that has been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable. Some imprints of human activity may exist if they are substantially unnoticeable. More consideration is given to "apparent naturalness" rather than "natural integrity." "Apparent naturalness" refers to whether or not an area appears to be in a natural condition to the average visitor who is not familiar with the biological composition of natural ecosystems versus human-affected ecosystems in a given area. Major influences on apparent naturalness are structures, evidence of past significant vegetative disturbance such as logging, and other obvious surface-disturbing activities. "Natural integrity" refers to the presence or absence of ecosystems that are relatively unaffected by human activity, such as the presence of native vegetative communities and absence of invasive species.

Outstanding Opportunities for Solitude. "Solitude" is defined as the state of being alone or remote from others; isolation; a lonely or secluded place. "Outstanding" is defined as standing out among others of its kind; conspicuous; prominent; superior to others of its kind; distinguished; excellent. Presence of this wilderness characteristic considers an individual's opportunity to avoid the sights, sounds, and evidence of other people in the area. Factors that affect opportunities for solitude are the size and configuration of the unit; vegetative and topographic screening; ability of visitors to find a secluded spot, even when others are present in the area. Does not consider the sights and sounds of human activity outside of the unit's boundaries unless they are so extremely imposing that they cannot be ignored.

Outstanding Opportunities for Primitive and Unconfined Recreation. Primitive and unconfined recreation includes activities that provide dispersed, undeveloped recreation which do not require facilities or motorized equipment. Some examples include but are not limited to: hiking, backpacking, fishing, hunting, caving, horseback riding, rock climbing, river running, cross-country skiing and bird watching. An area may possess outstanding opportunities for a primitive and unconfined type of recreation either through the diversity in the number of primitive and unconfined recreational activities possible or the outstanding quality of one opportunity.

The following includes a step-by-step evaluation and planning process that was used to: (1) review past wilderness inventories; (2) screen public wilderness proposals; (3) evaluate public wilderness proposals; (4) determine if proposed management would be applied to protect select units of BLM lands with wilderness characteristics; and (5) analyze each alternative's effect on all BLM lands with wilderness characteristics.

Step 1. Review past wilderness inventories.

BLM reviewed existing published wilderness inventory reports and maps that were prepared as a result of the original inventories conducted between 1978 and 1980, under Section 603 of FLPMA. This review enabled BLM to determine if public wilderness proposals contained any new information that was not considered as part of the original inventories.

Step 2. Screen public wilderness proposals.

All public wilderness proposals were organized by BLM district. These proposals were mapped in GIS and then overlaid with O&C lands suitable for permanent timber production. All proposals were considered in the evaluation process; however, portions of those that occur on O&C lands suitable for permanent timber production were not considered further for protection.

Step 3. Evaluate public wilderness proposals.

BLM then determined if lands specified in each public wilderness proposal overlap the boundary of an original wilderness inventory unit, and if so, if any wilderness characteristics were identified in the original inventory of those lands. If necessary, original inventories were updated. If an inventory was not previously completed for a portion of BLM lands contained within a public wilderness proposal, then an assessment was completed to determine if wilderness characteristics currently exist. In most cases, this assessment was completed using existing field knowledge of an area and remote-sensing techniques such as: digital ortho photography, forest operations inventory data, and ground transportation road network data. On-the-ground evaluations were conducted if a reasonable determination could not be made using these techniques. Evaluation reports that summarize these results were developed for all public wilderness proposals. These reports were the basis for making a final determination of which BLM lands contain wilderness characteristics.

Step 4. Determine if proposed management would be applied to protect selected lands with wilderness characteristics.

BLM districts selected one of the following outcomes for each unit of BLM lands that was determined to contain wilderness characteristics: (1) emphasize the protection of wilderness characteristics as a priority over other uses, excluding portions that occur on O&C lands suitable for permanent timber production; or (2) emphasize other uses as a priority over protecting wilderness characteristics.

Step 5. Analyze each alternative's affect on BLM lands with wilderness characteristics.

See the Planning Criteria for the process used to analyze each alternative's affect on BLM lands with wilderness characteristics.



Appendix L. Grazing

This appendix provides the background information regarding standards for range improvements, grazing allotments, and standards for rangeland health. These topics are referenced in Chapters 1 -3 in the Draft EIS.

In this appendix:

Standard Procedures and Design Elements for Range Improvements within the Klamath Falls Resource Area 1263

Grazing Allotments in the Klamath Falls Resource Area and Medford District 1270

Standards for Rangeland Health 1284

Standard Procedures and Design Elements for Range Improvements within the Klamath Falls Resource Area

Table 282. Proposed Klamath Falls Range Improvements by Allotment.

Allotment	Allotment Number	Type of Improvement	Number	Approximate Location
Edge Creek*	00102	Reservoirs	2 each	T41S, R5E, S.11; T40S, R5E, S.35
		Fencing	3 miles	T41S, R5E, S.11,12; T41S, R6E, S.4,5,6,7,8
Buck Mountain	00103	Fencing	2 miles	T39S, R5E, S.11,13
Buck Lake	00104	Fencing	2 miles	T38S, R5E, S.15,28,29; T38S, R6E, S.20
Dixie*	00107	Fencing	2 miles	T41S, R5E, S.5,7; T41S, R4E, S.1,2,12
Grubb Springs	00147	Reservoirs	2 each	T39S, R6E, S. 7,15
Stock Drive	00802	Fencing	1 mile	T39S, R11E, S.31
J Spring	00803	Fencing	1 mile	T38S, R14E, S.32
Barnwell	00807	Reservoirs	2 each	T39S, R11.5E, S.4,8
Drew	00817	Reservoir	1 each	T38S, R11.5E, S.5
		Fencing	2 miles	T38S, R11.5E, S.5,6; T37S, R11.5E, S.31,32
North Horsefly	00821	Reservoir	1 each	T37S, R14E, S.16
Stukel-O'Neill	00822	Fencing	3 miles	T39S, R10E, S.25,26; T40S, R10E, S.1,2
North Horsefly	00823	Reservoir	1 each	T37S, R14E, S.4,9
		Fencing	2 miles	T37S, R14E, S.4,9
Haskins	00826	Fencing	1 mile	T38S, R11.5E, S.29,30
Stukel-High	00827	Reservoir	1 each	T39S, R11.5E, S.30,31
Horton	00829	Reservoir	1 each	T39S, R11.5E, S.15
Ketcham	00835	Fencing	1 mile	T39S, R11E, S.19
Harpold Chaining	00836	Reservoir	1 each	T39S, R11E, S.21,27,28
		Fencing	2 mile	T39S, R11E, S.21,27,28
Windy Ridge	00838	Reservoirs	2 each	T39S, R11.5E, S.24,25
Bryant-Loveness	00839	Fencing	2 miles	T41S, R13E, S.5,6,7,8,17
Short Lake	00842	Fencing	2 miles	T39S, R11E, S.27,28
OK	00846	Reservoirs	2 each	T40S, R9E, S.15,21,22
		Fencing	2 miles	T40S, R9E, S.15,21,22,27,28
Swede Cabin	00847	Fencing	2 miles	T36S, R15E, S.28,30,32
Harpold Ridge	00851	Reservoirs	2 each	T39S, R11E, S.29,30,31,32
		Fencing	2 miles	T39S, R11E, S.29,30,31,32
Rodgers	00852	Reservoirs	2 each	T40S, R11E, S.5,6,7,8
		Fencing	3 miles	T40S, R11E, S.5,6,7,8,9,10
McCartie	00860	Fencing	1 mile	T38S, R11E, S.26,35
		Reservoir	1 each	T38S, R11E, S.26,35
Yainax	00861	Fencing	1 mile	T38S, R11E, S.1,12,13
Mills Creek	00865	Reservoir	1 each	T41S, R13E, S.7
		Fencing	2 miles	T41S, R13E, S.7

continued on next page

Bear Valley	00876	Reservoir	1 each	T40S, R15E, S.17,18
		Fencing	2 miles	T40S, R14.5E, S.24,25; T40S, R15E, S.19,30,31
DeVaul	00879	Fencing	1 mile	T39S, R13E, S.10,11,15
Goodlow	00881	Fencing	1 mile	T39S, R13E, S.9,10,15
Horton	00883	Reservoir	1 each	T39S, R12E, S.22
Panky Basin	00884	Reservoir	1 each	T39S, R13E, S.27,28
		Fencing	1 mile	T39S, R13E, S.27,28
Dry Prairie	00885	Reservoirs	2 each	T38S, R13E, S.27,34,36
Rock Creek	00888	Fencing	2 miles	T41S, R15E, S.9,17
Timber Hill	00889	Reservoirs	2 each	T41S, R14.5E, S.11,12,14,23
Williams	00892	Fencing	2 miles	T39S, R12E, S.10,15

* Located within the Pokegama Herd Management Area

The following standard procedures and design elements would be adhered to in implementation of the proposed construction of range improvements within the Klamath Falls Resource Area.

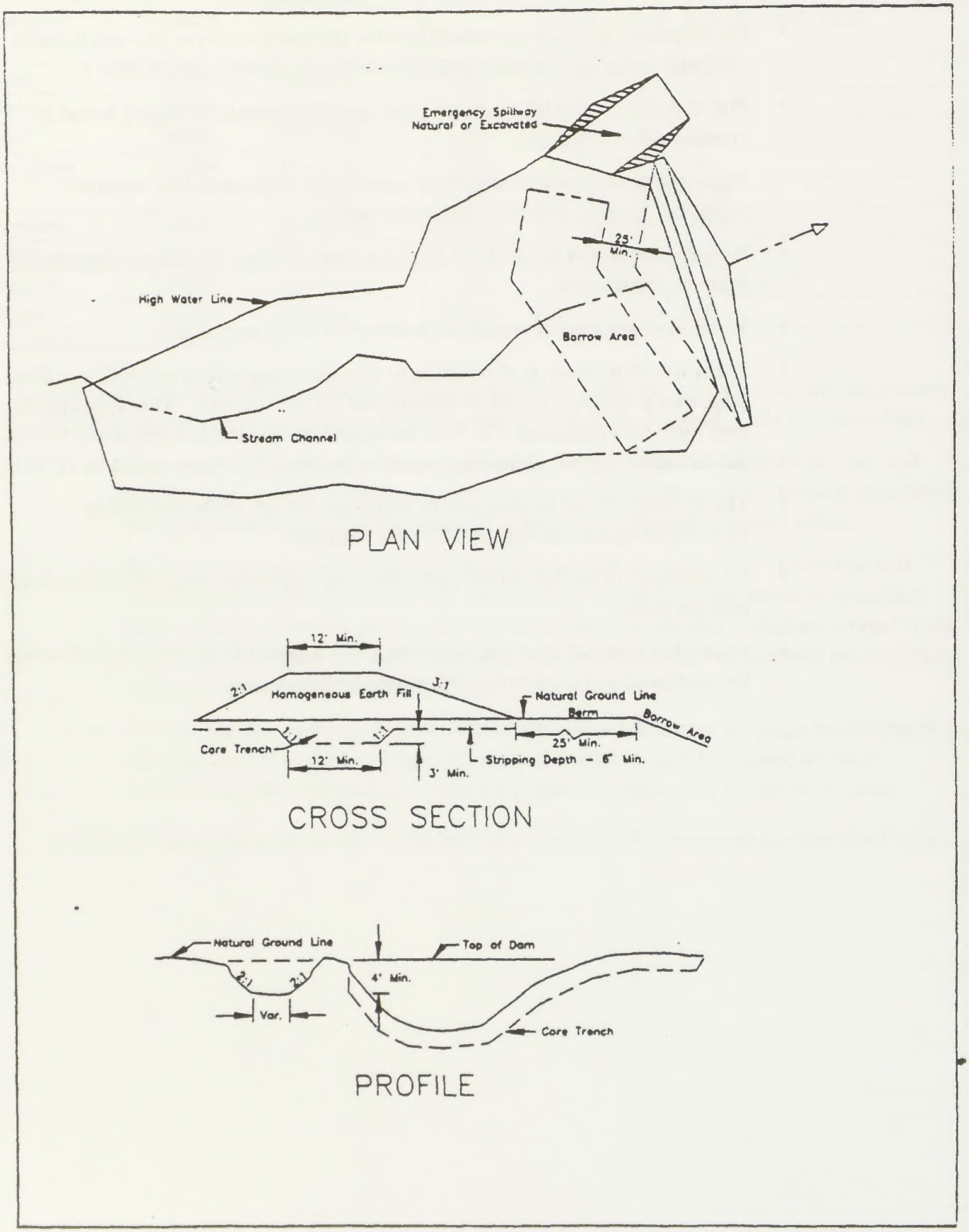
- Inventories and surveys for cultural resources, threatened and endangered species, and special status species would be conducted prior to authorization of any project construction, and appropriate mitigation implemented to reduce or eliminate potential effects.
- Surface disturbance at all project sites would be held to a minimum. Disturbed soil would be rehabilitated to blend into surrounding soil surface and reseeded as needed with a mixture of native grasses, forbs, and shrubs as applicable to replace ground cover, reduce soil loss from wind and water erosion, and discourage the potential establishment of any invasive, non-native plant species.
- Where possible, existing roads and trails would provide access for range improvement construction. If needed, unimproved trails and tracks would be created to reach construction sites and provide access for future maintenance of the improvements.

Additional design features specific to the individual types of improvements are described below.

Reservoirs

- Development of reservoirs would involve the construction of pits and dams to impound water for livestock and wildlife use as shown in Illustration 1.
- Pits would be in dry lake beds or other natural depressions. Dams would be constructed in drainages.
- Water rights applications would be coordinated with applicable agencies, irrigation districts, and other interested parties.
- Water rights would be obtained from the Oregon Water Resources Department prior to construction.
- Water storage capacity would range from 1.0 to 3.0 acre-feet.
- Dams would be located, if possible, to take advantage of natural spillway sites; otherwise a spillway would be constructed for the reservoir. The slopes of the dam must be a minimum 3 to 1 on the upstream face and minimum of 2 to 1 on the downstream face. Minimum width of the top of all dams would be 12 feet.
- The spillway would be designed to minimize the risk of the dam being overtopped during the design life of the structure.
- Fill material, if needed, would come from the impoundment area and/or a borrow area for dams.
- Excavated material from pits would be piled adjacent to the pit. Topsoil would be stockpiled and used to rehabilitate the borrow areas.

Figure 313. Reservoir Standards



Fencing

- Fences would be designed to prevent the passage of livestock without stopping the movement of wildlife as shown in Illustration 2.
- Wire spacing would follow the specifications found in Illustrations 3. The majority of fences would be constructed as follows: 4 wire with the bottom wire 16-18" off the ground with the sequence of the remaining three wires above this being 6", 6", and 12"; the maximum height of the fence (ground to top wire) would be 42".
- The bottom wire on all fencing would be two-strand smooth wire, not barbed, to facilitate antelope crossings.
- Steel "t-post" spacing would be between 16' and 24' depending on local conditions.
- Brace posts, tree scabs, and/or rock jacks (rock cribs) would be constructed to enhance fence integrity with one at least every ¼ mile.
- No woven wire "sheep" fences would be constructed on public lands.
- Brushing and tree limb removal will be limited to only that necessary for surveying, placement, and construction of a fence.
- Where fences cross existing roads, either gates or cattleguards would be installed.

Figure 314. Fence Standards

BLM Fence Standards for Livestock and Wildlife

Kinds of Use Combinations

Kinds of Livestock and Wild Burros	Predominant Big Game Wildlife Species	Number Wires	Max. Fence Height in Inches	Wire Spacing (From Ground Up, in Inches)	Wire Type	No. Stays Between Line Posts w/Spacing of 16.5' - 30'
STANDARD BUREAU FENCES:						
Cattle	None	4	42	16, 6, 8, 12	Barbed.	1 to 4
Sheep	None	-	36	2, 24 (Woven) 2, 8	Woven, barbed.	
STANDARD BUREAU MODIFICATIONS TO MEET MULTIPLE-USE NEEDS:						
Cattle (only)	Antelope, Javelina, or Deer and Antelope.	3	38	16, 10, 12	Bottom strand smooth, others barbed.	One w/post spacing of 16.5' — 1 or 2 w/post spacing of 30'.
Sheep (only)	Antelope, Javelina or Deer	4	32	12, 6, 6, 8 16.5' — 1 or 2	Bottom strand smooth, others barbed.	One w/post spacing of 16.5' — 1 to 3 w/post spacing of 30'.
Cattle and Sheep (Use only where sheep control is necessary.)	Antelope Javelina or Deer	4	38	15, 7, 8, 8	Bottom strand smooth, others barbed.	One w/post spacing of 16.5' — 1 to 3 w/post spacing of 30'.
Cattle and Sheep (normal conditions)	Deer, Elk Moose, or Antelope.	3	38	16, 10, 12	Bottom strand smooth, others barbed.	1 to 4
Cattle and sheep (Requires greater restriction of livestock movements.)	Deer, Elk, Moose, or Antelope.	4	40	16, 6, 6, 12	Barbed.	1 to 4
Cattle	Bighorn Sheep*	3	39	20, 15, 4	Barbed.	1 to 4
Cattle, Wild Burros	Bighorn Sheep* (Use around watering area)	-	42	18 to bottom rail; 34 and 42 to top of middle and top rails.	Rails 2"-3" diameter.	Line Post spacing 10 feet
Cattle, Wild Burros	Bighorn Sheep*	6	38	18, 4, 4, 4 4, 4	Bottom strand smooth, others barbed.	1 to 2

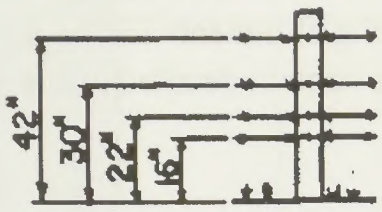
*These fences also meet antelope, and deer standards.

Figure 315. Wire Spacings

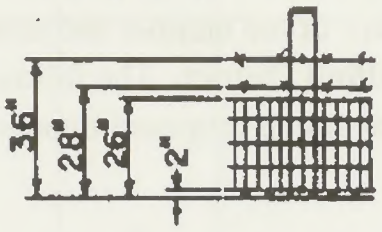
BLM WIRE SPACING STANDARDS

NOT TO SCALE

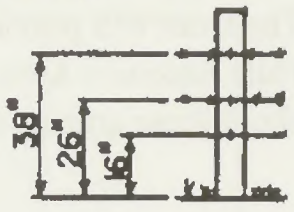
Cattle Only



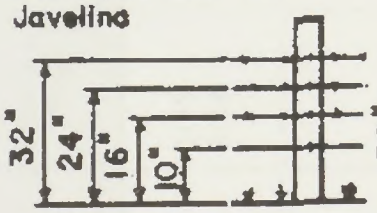
Sheep Only



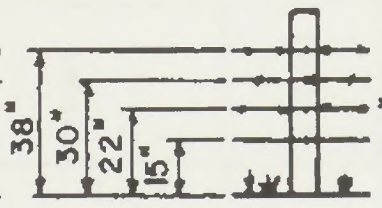
Combination Of Cattle With Antelope, Javelina Or Deer And Antelope



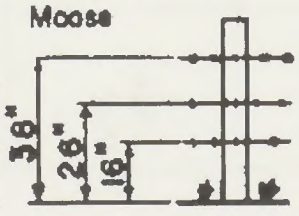
Combination Of Sheep Antelope, Deer Or Javelina



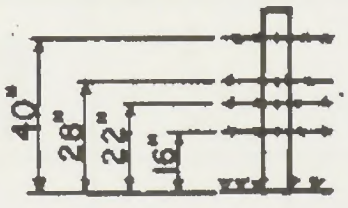
Combination Of Cattle And Sheep With Antelope, Deer Or Javelina



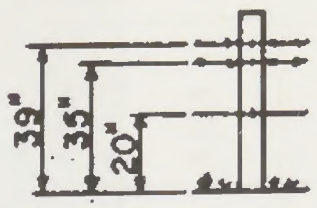
Combination Of Cattle And Sheep (Under Normal Conditions) With Deer, Elk Or Moose



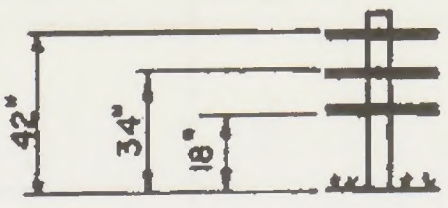
Combination Of Cattle (Requiring Greater Restriction Of Livestock Movements) With Deer, Elk, Moose, Or Antelope



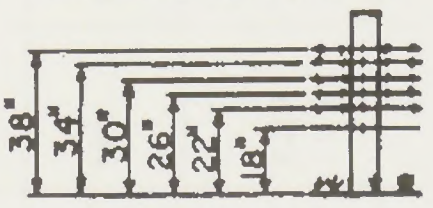
Combination Of Cattle With Bighorn Sheep



For Bighorn Watering Areas; Combination Of Cattle With Burros And Bighorn Sheep



Combination Of Cattle With Burros And Bighorn Sheep



If future rangeland improvement projects are proposed beyond those listed above, additional site-specific analysis of the environmental consequences would be necessary. Such changes could result from new initiatives or funding sources, changes in management priorities, new laws/ regulations, litigation, site specific activity planning, or future Rangeland Health Assessments.

Grazing Allotments in the Klamath Falls Resource Area and Medford District

The Draft EIS provides a summary of the number and acres of grazing allotments for the Klamath Falls Resource Area and the Medford District. The following tables contain detailed information about these grazing allotments including proposed improvements.

Table 283. Klamath Falls Resource Area Grazing Allotments.

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Chase Mountain	00101	8,823	195	0	5/15-8/13	C	2001	Not Meeting Standards, Grazing is not a factor	Yearly	None
Edge Creek	00102	8,860	207	0	5/1-9/1	I	2000	Not Meeting Standards, Grazing is not a factor	Deferred-Rotation	Proposed Range Improvement, Common Allotment, Exclosures or Other Areas Closed to Grazing, Portion Proposed for Closure
Buck Mountain[1]	00103	7,022	204	0	5/15-9/1	I	2000	Not Meeting Standards, Grazing is not a factor	Yearly	Proposed Range Improvement
Buck Lake	00104	11,971	280	0	6/15-10/15	C	2000	Not Meeting Standards, Grazing is not a factor	Yearly	Proposed Range Improvement, Common Allotment, Exclosures or Other Areas Closed to Grazing
Johnson Prairie	00105	120	12	0	5/1-10/1	C	2000	Not Meeting Standards, Grazing is not a factor	Yearly	None
Dixie[1]	00107	2,287	320	100	5/1-8/15	I	2002	Not Meeting Standards, Grazing is a factor	Yearly	Proposed Range Improvement Exclosures or Other Areas Closed to Grazing
Dry Lake	00140	145	10	0	5/1-6/30	C	2001	Not Meeting Standards, Grazing is not a factor	Yearly	None

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Chicken Hills	00141	3,422	80	0	5/15-9/15	C	2001	Not Meeting Standards, Grazing is not a factor	Yearly	None
Long Lake	00142	363	18	0	6/16-9/30	C	2000	Meeting All Standards	Yearly	None
Grubb Springs	00147	3,524	130	0	5/1-9/30	C	2000	Not Meeting Standards, Grazing is not a factor	Yearly	Proposed Range Improvement
Adams	00800	40	6	0	4/15-7/15	C	2005	Not Meeting Standards, Grazing is a factor	Yearly	None
Haught	00801	400	27	0	5/1-7/31	C	Not Completed	Not Completed	Yearly	None
Stock Drive	00802	40	2	0	5/1-6/30	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
J Spring	00803	320	7	0	5/1-6/30	C	2003	Meeting All Standards	Yearly	Proposed Range Improvement
Bar CL	00804	480	20	22	5/1-5/31	C	Not Completed	Not Completed	Yearly	None
SE 80	00805	80	8	0	5/1-10/31	C	2006	Meeting All Standards	Yearly	None
Two Mile	00806	577	56	0	5/1-9/30	C	2006	Not Meeting Standards, Grazing is not a factor	Yearly	None
Barnwell	00807	1,708	100	0	5/1-6/15	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Lee	00808	40	10	0	6/1-8/15	C	Not Completed	Not Completed	Yearly	None
Brown	00809	80	30	0	6/1-8/30	C	Not Completed	Not Completed	Yearly	None

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Brenda	00810	185	18	0	5/16-6/30	C	2006	Meeting All Standards	Yearly	None
Cheyne	00811	875	51	0	5/1-6/15	C	2004	Meeting All Standards	Yearly	None
Stukel-Coffin	00812	760	55	0	5/1-7/1	C	2002	Meeting All Standards	Yearly	None
Cunningham	00814	840	108	0	5/1-6/15	C	Not Completed	Not Completed	Yearly	None
Stukel-Dehlinger C.	00815	1,680	240	0	4/15-8/8	I	2002	Meeting All Standards	Yearly	None
Stukel-Dehlinger H.	00816	440	30	0	5/10-8/10	C	2002	Meeting All Standards	Yearly	None
Drew	00817	720	72	0	5/1-6/30	C	2005	Meeting All Standards	Yearly	Proposed Range Improvement
Dupont	00819	79	7	0	4/15-6/1	C	Not Completed	Not Completed	Yearly	None
North Horsefly	00821	988	68	0	5/1-6/15	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Stukel-O'Neill	00822	3,122	210	0	5/1-7/15	I	2002	Meeting All Standards	Yearly	Proposed Range Improvement Exclosures or Other Areas Closed to Grazing
North Horsefly	00823	920	60	0	6/16-8/1	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Jeld-Wen	00824	240	24	0	6/1-7/15	C	2006	Meeting All Standards	Yearly	None
Naylox	00825	760	76	0	5/1-6/30	C	2005	Meeting All Standards	Yearly	None
Haskins	00826	560	80	0	5/1-7/15	C	2004	Meeting All Standards	Yearly	Proposed Range Improvement
Stukel-High	00827	239	17	0	5/1-6/15	C	2003	Meeting All Standards	Yearly	Proposed Range Improvement

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Stukel-Hill	00828	960	60	0	5/1-6/15	C	2002	Meeting All Standards	Yearly	None
Horton	00829	760	26	0	4/21-6/30	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Hungry Hollow	00830	280	40/H	0	6/1-8/30	C	2005	Meeting All Standards	Yearly	Proposed for Conversion from Horse to Cattle
Warlow	00831	460	50	0	5/1-9/30	C	Not Completed	Not Completed	Yearly	None
Jesperson	00832	1578	158	0	5/1-7/1	C	Not Completed	Not Completed	Yearly	None
Kellison	00834	335	19	0	5/1-6/13	C	2004	Not Meeting Standards, Grazing is a factor	Yearly	None
Ketcham	00835	320	20	0	5/1-6/15	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Harpold Chaining	00836	900	96	0	5/1-5/30	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Bryant-Horton	00837	1,249	130	0	6/1-7/9	C	2006	Meeting All Standards	Yearly	None
Windy Ridge	00838	600	52	0	5/1-5/31	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Bryant-Loveness	00839	3,440	490	0	5/1-6/30	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Bryant-Lyon	00840	565	38	0	5/1-9/30	C	Not Completed	Not Completed	Yearly	None
Marshall	00841	348	14	0	4/21-5/30	C	Not Completed	Not Completed	Yearly	None
Short Lake	00842	440	40	0	5/1-6/30	C	2005	Not Meeting Standards, Grazing is a factor	Yearly	Proposed Range Improvement

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
McAuliffe	00843	80	10	0	4/16-6/15	C	Not Completed	Not Completed	Yearly	None
Paddock	00844	440	31	0	5/1-6/30	M	2003	Meeting All Standards	Deferred-Rotation	None
Klamath Hills	00845	500	55	0	4/1-5/31	C	Not Completed	Not Completed	Yearly	None
OK	00846	1,260	105	35	5/1-6/15	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Swede Cabin	00847	1,921	108	0	5/1-6/15	I	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Pope	00848	724	57	0	5/1-7/31	C	Not Completed	Not Completed	Yearly	None
Rajnus Bros.	00849	240	16	0	5/1-6/17	C	Not Completed	Not Completed	Yearly	None
Wilkinson	00850	400	18	0	5/1-6/5	C	Not Completed	Not Completed	Yearly	None
Harpold Ridge	00851	1,043	108	0	4/21-6/30	M	2006	Meeting All Standards	Yearly	Proposed Range Improvement
Rodgers	00852	2,355	235	0	5/1-7/1	I	2003	Meeting All Standards	Yearly	Proposed Range Improvement Exclosures or Other Areas Closed to Grazing
7C	00853	688	104	0	5/1-6/30	C	Not Completed	Not Completed	Yearly	None
Jump	00854	200	20	0	5/1-5/30	C	Not Completed	Not Completed	Yearly	None
Bryant-Smith	00855	1,140	109	0	5/15-8/31	C	Not Completed	Not Completed	Yearly	None
Bryant-Stastny	00856	440	70	0	5/10-9/30	C	Not Completed	Not Completed	Yearly	None
Bryant-Taylor	00857	1,080	74	0	4/15-9/30	C	Not Completed	Not Completed	Yearly	None

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Swan Lake Rim	00858	6,448	300	0	5/1-6/30	M	2006	Meeting All Standards	Rest-Rotation	Common Allotment
Cunard	00859	370	60/H	0	5/1-7/31	C	2002	Meeting All Standards	Rest-Rotation	Proposed for Conversion from Horse to Cattle
McCartie	00860	545	83	0	5/1-5/30	C	2004	Meeting All Standards	Rest-Rotation	Proposed Range Improvement
Yainax Butte	00861	2,520	120	0	7/1-9/30	M	2005	Meeting All Standards	Deferred-Rotation	Proposed Range Improvement Exclosures or Other Areas Closed to Grazing
Klamath Forest Estates	00862	2,520	47	0	5/1-5/31	M	2005	Meeting All Standards	Yearly	None
Wirth	00863	1,200	100	0	4/15-10/15	C	Not Completed	Not Completed	Yearly	None
Rajnus & Son	00864	1,440	110	0	5/1-6/30	C	Not Completed	Not Completed	Yearly	None
Mills Creek	00865	280	40	0	5/1-6/14	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Bear Valley	00876	5,018	432	0	7/1-8/9	I	2000/2003	Meeting All Standards	Deferred-Rotation	Proposed Range Improvement, Common Allotment, Exclosures or Other Areas Closed to Grazing
Bumpheads	00877	9,220	420	265	4/21-6/30	I	2003	Not Meeting Standards, Grazing is a factor	Deferred-Rotation	Exclosures or Other Areas Closed to Grazing
Campbell	00878	1,465	47/H	13	5/1-10/26	C	2002	Meeting All Standards	Yearly	Proposed for Conversion from Horse to Cattle

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
DeVaul	00879	240	12	15	5/1-8/30	C	2003	Meeting All Standards	Yearly	Proposed Range Improvement
Goodlow	00881	285	32	52	5/1-8/31	C	2003	Meeting All Standards	Yearly	Proposed Range Improvement
Horsefly	00882	26,356	2656	2075	4/15-6/30, 10/1-11/15	I	1999/2003	Meeting All Standards	Rest-Rotation/ High Intensity-Short Duration	Exclosures or Other Areas Closed to Grazing, Common Allotment
Horton	00883	800	58	211	4/21-5/20	C	2002	Meeting All Standards	Yearly	Proposed Range Improvement
Pankey Basin	00884	282	43	38	5/15-8/31	C	2003	Not Meeting Standards, Grazing is a factor	Yearly	Proposed Range Improvement Exclosures or Other Areas Closed to Grazing
Dry Prairie	00885	7,231	642	358	5/1-9/30	I	1999/2003	Meeting All Standards	Rest-Rotation	Exclosures or Other Areas Closed to Grazing, Common Allotment, Proposed Range Improvement
Horse Camp Rim	00886	9,180	445	281	5/1-7/31	I	2003	Meeting All Standards	Rest-Rotation	Exclosures or Other Areas Closed to Grazing
Pitchlog	00887	9,280	434	796	5/10-6/30	I	1999/2003	Meeting All Standards	Rest-Rotation/ High Intensity-Short Duration	Exclosures or Other Areas Closed to Grazing
Rock Creek	00888	2,750	216	639	5/1-5/31	I	2003	Meeting All Standards	Rest-Rotation	Proposed Range Improvement
Timber Hill	00889	2,937	270	134	6/21-7/31	I	1999/2003	Meeting All Standards	Yearly	Proposed Range Improvement

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Willow Valley	00890	20,460	1258	506	4/15-6/30	I	2000/2003	Not Meeting Standards, Grazing is a factor	Rest-Rotation	Exclosures or Other Areas Closed to Grazing, Common Allotment
Williams	00892	1,790	75	0	5/1-5/31	M	2004	Meeting All Standards	Yearly	Proposed Range Improvement
Fields	00893	180	6	0	4/21-5/20	C	2005	Meeting All Standards	Yearly	None
Voight	00894	112	8	0	5/1-6/15	C	2003	Meeting All Standards	Yearly	None
Harpold Canyon	00895	760	76	0	5/1-9/30	C	2006	Meeting All Standards	Yearly	None
McFall	00896	600	60	0	5/1-6/30	C	2006	Meeting All Standards	Yearly	Common Allotment
Bly Mountain	01800	120	9	0	6/1-8/31	C	Not Completed	Not Completed	Yearly	None
Wood River	30855	2,970	0	0	N/A	N/A	2000	Not Meeting Standards, Grazing is not a factor	N/A	Exclosures or Other Areas Closed to Grazing
		204,815	13,103	5,540						

[1]All or a portion of the allotment is located within the Cascade-Siskiyou National Monument

[2]Active Preference is cattle AUMs unless specified as H for domestic horse use

[3]Selective Management Categories: Improve (I)-managed to resolve a high level of resource conflicts and concerns and receive the highest priority for funding and management actions; Maintain (M)-managed to maintain satisfactory resource conditions and will be actively managed to ensure that resource values do not decline; Custodial (C)-managed custodially to protect resource conditions and values.

Table 284. Medford Grazing Allotments.

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Lost Creek	10001	11,518	382	0	04/16-10/31	I	2001	Not Meeting Standards, Grazing is not a factor	Yearly	Common Allotment
Flat Creek	10002	12,421	328	0	05/01-10/15	C	2000	Not Meeting Standards, Grazing is not a factor	Yearly	None
Longbranch	10004	320	22	0	04/16-05/15	C	2002	Meeting All Standards	Yearly	Portion Proposed for Closure
Meadows	10007	1,564	92	0	04/16-06/30	I	2003	Meeting All Standards	Yearly	None
Neil-Tarbell	10008	552	56	0	04/16-05/31	C	2003	Meeting All Standards	Yearly	None
North Sams Valley	10009	120	8	0	06/16-07/31	C	2002	Not Meeting Standards, Grazing is not a factor	Yearly	None
Upper Table Rock	10012	1,240	66	0	05/01-05/30	I	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Clear Creek	10013	3,790	45	0	05/16-10/31	C	2002	Meeting All Standards	Yearly	None
Lick Creek	10015	202	15	0	04/16-05/15	C	2003	Meeting All Standards	Yearly	None
Brownsboro Park	10016	381	68	0	04/16-05/31	I	2002	Not Meeting Standards, Grazing is not a factor	Yearly	None

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Kanutchan Fields	10017	2,419	177	0	04/16-05/31	I	2002	Not Meeting Standards, Grazing is not a factor	Yearly	None
Sugarloaf	10019	1,566	15	0	04/16-06/30	C	2002	Meeting All Standards	Yearly	None
Section 9	10021	404	25	0	04/16-06/30	C	2003	Meeting All Standards	Yearly	None
Section 7	10022	371	11	0	04/16-05/31	C	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Bull Run	10023	40	5	0	06/01-06/30	C	2003	Meeting All Standards	Yearly	None
Big Butte	10024	22,118	1,663	0	04/16-06/30	I	2000	Not Meeting Standards, Grazing is not a factor	Deferred-Rotation	Common Allotment
Reese Creek	10027	40	7	0	05/01-06/30	C	1999	Meeting All Standards	Yearly	Common Allotment
Derby Road Sawmill	10029	521	45	0	04/16-07/15	C	2003	Meeting All Standards	Yearly	None
Summit Prairie	10031	30,743	1,165	0	04/16-09/30	I	1999	Not Meeting Standards, Grazing is not a factor	Deferred-Rotation	Common Allotment
Vestal Butte	10035	2,240	120	0	04/16-06/15	I	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Bear Mountain	10037	1,008	81	0	04/16-05/31	I	2002	Meeting All Standards	Yearly	None

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Crowfoot	10038	7,393	365	0	04/15-16/30	I	2003	Meeting All Standards	Yearly	None
Crowfoot Creek	10039	521	70	0	04/16-06/30	C	1999	Meeting All Standards	Yearly	None
Cobleigh Road	10040	80	7	0	06/01-07/15	C	2003	Meeting All Standards	Yearly	None
Moser Mountain	10041	40	3	0	04/16-04/30	C	2003	Meeting All Standards	Yearly	None
Devon South	10043	402	33	0	04/16-06/30	C	1999	Meeting All Standards	Yearly	None
Salt Creek	10044	462	85	0	04/16-06/30	I	2002	Meeting All Standards	Yearly	None
Jenny Creek[1]	10108	1,417	115	0	05/16-09/10	I	Not Completed	Not Completed	Deferred-Rotation	
Agate[1]	10109	82	9	0	05/01-09/15	C	Not Completed	Not Completed	Yearly	
Soda Mountain[1]	10110	35,619	1,794	0	05/01-10/15	I	Not Completed	Not Completed	Deferred-Rotation	Common Allotment
Cove Creek	10112	1,207	75	0	05/01-06/15	I	Not Completed	Not Completed	Yearly	None
Buckpoint	10114	3,835	150	0	05/01-06/15	C	Not Completed	Not Completed	Yearly	None
Keene Creek[1]	10115	23,643	1,612	0	05/01-10/15	I	Not Completed	Not Completed	Yearly	Common Allotment
Howard Prairie	10116	320	60	0	10/16-11/15	M	Not Completed	Not Completed	Yearly	None
Siskiyou[1]	10118	2,163	200	0	05/01-09/15	I	Not Completed	Not Completed	Yearly	

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Grizzly	10119	5,167	378	0	06/01-10/15	I	1999	Not Meeting Standards, Grazing is not a factor	Yearly	Common Allotment
Lake Creek Spring	10121	4,679	447	0	05/16-07/15	I	Not Completed	Not Completed	Yearly	None
Lake Creek Summer	10122	5,561	550	0	07/16-10/15	I	Not Completed	Not Completed	Yearly	None
Deer Creek-Reno Lease	10124	4,025	314	0	05/01-09/30	C	Not Completed	Not Completed	Yearly	None
Heppsie Mountain	10126	4,076	294	0	05/01-10/15	I	Not Completed	Not Completed	Yearly	None
Antelope Road	10132	200	19	0	04/16-05/30	C	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Brownsboro	10133	80	7	0	04/01-06/15	C	2003	Meeting All Standards	Yearly	None
Yankee Reservoir	10134	120	15	0	05/01-06-15	I	2003	Meeting All Standards	Yearly	None
Canal	10136	440	58	0	05/01-06/15	C	2003	Meeting All Standards	Yearly	None
Box R Ranch[1]	10137	88	5	0	10/01-02/28	C	Not Completed	Not Completed	Yearly	None
Cove Ranch	10143	80	20	0	07/01-11/30	C	Not Completed	Not Completed	Yearly	None
North Cove Creek	10148	281	20	0	07/16-09/15	C	Not Completed	Not Completed	Yearly	None
Deadwood[1]	20106	8,004	788	0	06/16-08/15	I	Not Completed	Not Completed	Yearly	Common Allotment

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs)[2]	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category[3]	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Poole Hill	20113	1,760	25	0	10/01-10/15	C	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Conde Creek	20117	5,346	591	0	06/16-09/30	I	Not Completed	Not Completed	Yearly	Common Allotment
Billy Mountain	20203	4,758	175	0	04/16-06/30	I	1999	Not Meeting Standards, Grazing is not a factor	Yearly	None
Lower Big Applegate	20206	11,712	258	0	04/16-06/15	I	Not Completed	Not Completed	Yearly	None
Foots Creek	20219	115	12	0	05/01-06/30	C	1999	Meeting All Standards	Yearly	None
Ferns Lease	20224	246	28	0	05/01-06/15	C	Not Completed	Not Completed	Yearly	None
Deer Creek	20308	887	77	0	04/01-12/15	C	2003	Not Meeting Standards, Grazing is not a factor	Yearly	Portion Proposed for Closure
		228,387	13,055	0						

[1]All or a portion of the allotment is located within the Cascade-Siskiyou National Monument

[2]Active Preference is cattle AUMs

[3]Selective Management Categories: Improve (I)-managed to resolve a high level of resource conflicts and concerns and receive the highest priority for funding and management actions; Maintain (M)-managed to maintain satisfactory resource conditions and will be actively managed to ensure that resource values do not decline; Custodial (C)-managed custodially to protect resource conditions and values.

Standards for Rangeland Health

The following section contains the Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington. These standards and guidelines are referenced in Chapters 2, 3, and 4 of this Draft EIS. Livestock grazing would be managed in accordance with these standards and guidelines.

Figure 316. Standards for Rangeland Health.

STANDARDS FOR RANGELAND HEALTH

AND

GUIDELINES FOR LIVESTOCK GRAZING MANAGEMENT

FOR

PUBLIC LANDS ADMINISTERED BY THE BUREAU OF LAND MANAGEMENT IN THE STATES OF OREGON AND

WASHINGTON

AUGUST 12, 1997

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Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington

Introduction

These Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington were developed in consultation with Resource Advisory Councils and Provincial Advisory Committees, tribes and others. These standards and guidelines meet the requirements and intent of 43 Code of Federal Regulations, Subpart 4180 (Rangeland Health) and are to be used as presented, in their entirety. These standards and guidelines are intended to provide a clear statement of agency policy and direction for those who use public lands for livestock grazing, and for those who are responsible for their management and accountable for their condition. Nothing in this document should be interpreted as an abrogation of Federal trust responsibilities in protection of treaty rights of Indian tribes or any other statutory responsibilities including, but not limited to, the Taylor Grazing Act, the Clean Water Act, and the Endangered Species Act.

Fundamentals of Rangeland Health

The objectives of the rangeland health regulations referred to above are: "to promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions; . . . and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands."

and soil stability. The biological components addressed in the standards focus on the roles and interactions of plants, animals and microbes (producers, consumers and decomposers), and their habitats in the ecosystem. The biological component of rangeland ecosystems is supported by physical function of the system, and it is recognized that biological activity also influences and supports many of the ecosystem's physical functions.

Guidance contained in 43 CFR 4180 of the regulations directs management toward the maintenance or restoration of the physical function and biological health of rangeland ecosystems. Focusing on the basic ecological health and function of rangelands is expected to provide for the maintenance, enhancement, or creation of future social and economic options.

The standards are based upon the ecological potential and capability of each site. In assessing a site's condition or degree of function, it must be understood that the evaluation compares each site to its own potential or capability. Potential and capability are defined as follows:

Potential-The highest level of condition or degree of function a site can attain given no political, social or economic constraints.

Capability-The highest level of condition or degree of function a site can attain given certain political, social or economic constraints. For example, these constraints might include riparian areas permanently occupied by a highway or railroad bed that prevent the stream's full access to its original flood plain. If such constraints are removed, the site may be able to move toward its potential.

In designing and implementing management strategies to meet the standards of rangeland health, the potential of the site must be identified, and any constraints recognized, in order that plan goals and objectives are realistic and physically and economically achievable.

Standards and Guidelines in Relation to the Planning Process

The standards apply to the goals of land use plans, activity plans, and project plans (Allotment Management Plans, Annual Operating Plans, Habitat Management Plans, etc.). They establish the physical and biological conditions or degree of function toward which management of publicly-owned rangeland is to be directed. In the development of a plan, direction provided by the standards and the social and economic needs expressed by local communities and individuals are brought together in formulating the goal(s) of that plan.

When the standards and the social and economic goals of the planning participants are woven together in the plan goal(s), the quantifiable, time specific objective(s) of the plan are then developed. Objectives describe and quantify the desired future conditions to be achieved within a specified timeframe. Each plan objective should address the physical, biological, social and economic elements identified in the plan goal.

To help meet these objectives, the regulations on rangeland health identify fundamental principles providing direction to the States, districts, and on-the-ground public land managers and users in the management and use of rangeland ecosystems.

A hierarchy, or order, of ecological function and process exists within each ecosystem. The rangeland ecosystem consists of four primary, interactive components: a physical component, a biological component, a social component, and an economic component. This perspective implies that the physical function of an ecosystem supports the biological health, diversity and productivity of that system. In turn, the interaction of the physical and biological components of the ecosystem provides the basic needs of society and supports economic use and potential.

The Fundamentals of Rangeland Health stated in 43 CFR 4180 are:

1.Watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity and the timing and duration of flow.

2.Ecological processes, including the hydrologic cycle, nutrient cycle and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.

3.Water quality complies with State water quality standards and achieves, or is making significant progress toward achieving, established Bureau of Land Management objectives such as meeting wildlife needs.

4.Habitats are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered species, Federal Proposed, Category 1 and 2 Federal candidate and other special status species.

The fundamentals of rangeland health combine the basic precepts of physical function and biological health with elements of law relating to water quality, and plant and animal populations and communities. They provide direction in the development and implementation of the standards for rangeland health.

Standards for Rangeland Health

The standards for rangeland health (standards), based on the above fundamentals, are expressions of the physical and biological condition or degree of function necessary to sustain healthy rangeland ecosystems. Although the focus of these standards is on domestic livestock grazing on Bureau of Land Management lands, on-the-ground decisions must consider the effects and impacts of all uses.

Standards that address the physical components of rangeland ecosystems focus on the roles and interactions of geology and landform, soil, climate and water as they govern watershed function

Standards apply to all ecological sites and land forms on public rangelands throughout Oregon and Washington. The standards require site-specific information for full on-ground usability. For each standard, a set of indicators is identified for use in tailoring the standards to site-specific situations. These indicators are used for rangeland ecosystem assessments and monitoring and for developing terms and conditions for permits and leases that achieve the plan goal.

Guidelines for livestock grazing management offer guidance in achieving the plan goal and objectives. The guidelines outline practices, methods, techniques and considerations used to ensure that progress is achieved in a way, and at a rate, that meets the plan goal and objectives.

Indicators of Rangeland Health

The condition or degree of function of a site in relation to the standards and its trend toward or away from any standard is determined through the use of reliable and scientifically sound indicators. The consistent application of such indicators can provide an objective view of the condition and trend of a site when used by trained observers.

For example, the amount and distribution of ground cover can be used to indicate that infiltration at the soil surface can take place as described in the standard relating to upland watershed function. In applying this indicator, the specific levels of plant cover necessary to support infiltration in a particular soil should be identified using currently available information from reference areas, if they exist; from technical sources like soil survey reports, Ecological Site Inventories, and Ecological Site Descriptions, or from other existing reference materials.

Reference areas are lands that best represent the potential of a specific ecological site in both physical function and biological health. In many instances potential reference areas are identified in Ecological Site Descriptions and are referred to as "type locations." In the absence of suitable reference areas, the selection of indicators to be used in measuring or judging condition or function should be made by an interdisciplinary team of experienced professionals and other trained individuals.

Not all indicators identified for each standard are expected to be employed in every situation. Criteria for selecting appropriate indicators and methods of measurement and observation include, but are not limited to: 1. the relationship between the attribute(s) being measured or observed and the desired outcome; 2. the relationship between the activity (e.g., livestock grazing) and the attribute(s) being measured or observed; and 3. funds and workforce available to conduct the measurements or observations.

Assessments and Monitoring

The standards are the basis for assessing and monitoring rangeland condition and trend. Carrying out well-designed assessment and monitoring is critical to restoring or maintaining healthy rangelands and determining trends and conditions.

Assessments are a cursory form of evaluation based on the standards that can be used at different landscape scales. Assessments, conducted by qualified interdisciplinary teams (which may

include but are not limited to physical, biological and social specialists, and interagency personnel) with participation from permittees and other interested parties, are appropriate at the watershed and sub-watershed levels, at the allotment and pasture levels and on individual ecological sites or groups of sites. Assessments identify the condition or degree of function within the rangeland ecosystem and indicate resource problems and issues that should be monitored or studied in more detail. The results of assessments are a valuable tool for managers in assigning priorities within an administrative area and the subsequent allocation of personnel, money and time in resource monitoring and treatment. The results of assessments may also be used in making management decisions where an obvious problem exists.

Monitoring, which is the well documented and orderly collection, analysis and interpretation of resource data, serves as the basis for determining trends in the condition or degree of function of rangeland resources and for making management decisions. Monitoring should be designed and carried out to identify trends in resource conditions, to point out resource problems, to help indicate the cause of such problems, to point out solutions, and/or to contribute to adaptive management decisions. In cases where monitoring data do not exist, professional judgment, supported by interdisciplinary team recommendation, may be relied upon by the authorized officer in order to take necessary action. Review and evaluation of new information must be an ongoing activity.

To be effective, monitoring must be consistent over time, throughout administrative areas, and in the methods of measurement and observation of selected indicators. Those doing the monitoring must have the knowledge and skill required by the level or intensity of the monitoring being done, as well as the experience to properly interpret the results. Technical support for training must be made available.

Measurability

It is recognized that not every area will immediately meet the standards and that it will sometimes be a long-term process to restore some rangelands to properly functioning condition. It is intended that in cases where standards are not being met, measurable progress should be made toward achieving those standards, and significant progress should be made toward fulfilling the fundamentals of rangeland health. Measurability is defined on a case-specific basis based upon the stated planning objectives (i.e., quantifiable, time specific), taking into account economic and social goals along with the biological and ecological capability of the area. To the extent that a rate of recovery conforms with the planning objectives, the area is allowed the time to meet the standard under the selected management regime.

Implementation

The material contained in this document will be incorporated into existing Land Use Plans and used in the development of new Land Use Plans. According to 43 CFR 4130.3-1, permits and leases shall incorporate terms and conditions that ensure conformance with 43 CFR 4180. Terms and conditions of existing permits and leases will be modified to reflect standards and guidelines at the earliest possible date with priority for modification being at the discretion of the authorized

officer. Terms and conditions of new permits and leases will reflect standards and guidelines in their development.

Indicators identified in this document will serve as a focus of interpretation of existing monitoring data and will provide the basis of design for monitoring and assessment techniques, and in the development of monitoring and assessment plans.

The authorized officer shall take appropriate action as soon as practicable but not later than the start of the next grazing year upon determining, through assessment or monitoring by experienced professionals and interdisciplinary teams, that a standard is not being achieved and that livestock are a significant contributing factor to the failure to achieve the standards and conform with the guidelines.

Standards for Rangeland Health

Standard 1 Watershed Function – Uplands

Upland soils exhibit infiltration and permeability rates, moisture storage and stability that are appropriate to soil, climate and landform.

Rationale and Intent

This standard focuses on the basic physical functions of upland soils that support plant growth, the maintenance or development of plant populations and communities, and promote dependable flows of quality water from the watershed.

To achieve and sustain rangeland health, watersheds must function properly. Watersheds consist of three principle components: the uplands, riparian/wetland areas and the aquatic zone. This standard addresses the upland component of the watershed. When functioning properly, within its potential, a watershed captures, stores and safely releases the moisture associated with normal precipitation events (equal to or less than the 25 year, 5 hour event) that falls within its boundaries. Uplands make up the largest part of the watershed and are where most of the moisture received during precipitation events is captured and stored.

While all watersheds consist of similar components and processes, each is unique in its individual makeup. Each watershed displays its own pattern of landform and soil, its unique climate and weather patterns, and its own history of use and current condition. In directing management toward achieving this standard, it is essential to treat each unit of the landscape (soil, ecological site, and watershed) according to its own capability and how it fits with both smaller and larger units of the landscape.

A set of potential indicators has been identified for which site-specific criteria will be used to determine if this standard is being met. The appropriate indicators to be used in determining attainment of the standard should be drawn from the following list.

Potential Indicators

Protection of the soil surface from raindrop impact; detention of overland flow; maintenance of infiltration and permeability, and protection of the soil surface from erosion, consistent with the potential/capability of the site, as evidenced by the:

° amount and distribution of plant cover (including forest canopy cover);
° amount and distribution of plant litter;
° accumulation/incorporation of organic matter;
° amount and distribution of bare ground;
° amount and distribution of rock, stone, and gravel;
° plant composition and community structure;
° thickness and continuity of A horizon;
° character of micro-relief;
° presence and integrity of biotic crusts;
° root occupancy of the soil profile;
° biological activity (plant, animal, and insect); and
° absence of accelerated erosion and overland flow.

Soil and plant conditions promote moisture storage as evidenced by:

° amount and distribution of plant cover (including forest canopy cover);
° amount and distribution of plant litter;
° plant composition and community structure; and
° accumulation/incorporation of organic matter.

Standard 2 Watershed Function - Riparian/Wetland Areas

Riparian-wetland areas are in properly functioning physical condition appropriate to soil, climate, and landform.

Rationale and Intent

Riparian-wetland areas are grouped into two major categories: 1. lentic, or standing water systems such as lakes, ponds, seeps, bogs, and meadows; and 2. lotic, or moving water systems such as rivers, streams, and springs. Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Riparian areas commonly occupy the transition zone between the uplands and surface water bodies (the aquatic zone) or permanently saturated wetlands.

Properly functioning condition of riparian and wetland areas describes the degree of physical function of these components of the watershed. Their functionality is important to water quality in the capture and retention of sediment and debris, the detention and detoxification of pollutants, and in moderating seasonal extremes of water temperature. Properly functioning riparian areas and wetlands enhance the timing and duration of streamflow through dissipation of flood energy, improved bank storage, and ground water recharge. Properly functioning condition should not be confused with the Desired Plant Community (DPC) or the Desired Future Condition (DFC) since, in most cases, it is the precursor to these levels of resource condition and is required for their attainment.

A set of indicators has been identified for which site-specific criteria will be used to determine if this standard is being met. The criteria are based upon the potential (or upon the capability where potential cannot be achieved) of individual sites or land forms.

Potential Indicators

Hydrologic, vegetative, and erosional/depositional processes interact in supporting physical function, consistent with the potential or capability of the site, as evidenced by:

° frequency of floodplain/wetland inundation;
° plant composition, age class distribution, and community structure;
° root mass;
° point bars revegetating;
° streambank/shoreline stability;
° riparian area width;
° sediment deposition;
° active/stable beaver dams;
° coarse/large woody debris;
° upland watershed conditions;
° frequency/duration of soil saturation; and
° water table fluctuation.

Stream channel characteristics are appropriate for landscape position as evidenced by:

° channel width/depth ratio;
° channel sinuosity;
° gradient;
° rocks and coarse and/or large woody debris;
° overhanging banks;
° pool/riffle ratio;
° pool size and frequency; and
° stream embeddedness.

Standard 3 Ecological Processes

Healthy, productive and diverse plant and animal populations and communities appropriate to soil, climate and landform are supported by ecological processes of nutrient cycling, energy flow and the hydrologic cycle.

Rationale and Intent

This standard addresses the ecological processes of energy flow and nutrient cycling as influenced by existing and desired plant and animal communities without establishing the kinds, amounts or proportions of plant and animal community compositions. While emphasis may be on native species, an ecological site may be capable of supporting a number of different native and introduced plant and animal populations and communities while meeting this standard. This standard also addresses the hydrologic cycle which is essential for plant growth and appropriate levels of energy flow and nutrient cycling. Standards 1 and 2 address the watershed aspects of the hydrologic cycle.

With few exceptions, all life on earth is supported by the energy supplied by the sun and captured by plants in the process of photosynthesis. This energy enters the food chain when plants are consumed by insects and herbivores and passes upward through the food chain to the carnivores. Eventually, the energy reaches the decomposers and is released as the thermal output of decomposition or through oxidation.

The ability of plants to capture sunlight energy, to grow and develop, to play a role in soil development and watershed function, to provide habitat for wildlife and to support economic uses depends on the availability of nutrients and moisture. Nutrients necessary for plant growth are made available to plants through the decomposition and metabolization of organic matter by insects, bacteria and fungi, the weathering of rocks and extraction from the atmosphere. Nutrients are transported through the soil by plant uptake, leaching and by rodent, insect and microbial activity. They follow cyclical patterns as they are used and reused by living organisms.

The ability of rangelands to supply resources and satisfy social and economic needs depends on the buildup and cycling of nutrients over time. Interrupting or slowing nutrient cycling can lead to site degradation, as these lands become increasingly deficient in the nutrients plants require.

Some plant communities, because of past use, frequent fire or other histories of extreme or continued disturbance, are incapable of meeting this standard. For example, shallow-rooted winter-annual grasses that completely dominate some sites do not fully occupy the potential rooting depth of some soils, thereby reducing nutrient cycling well below optimum levels. In addition, these plants have a relatively short growth period and thus capture less sunlight than more diverse plant communities. Plant communities like those cited in this example are considered to have crossed the threshold of recovery and often require great expense to be recovered. The cost of recovery must be weighed against the site's potential ecological/economic value in establishing treatment priorities.

The role of fire in natural ecosystems should be considered, whether it acts as a primary driver or only as one of many factors. It may play a significant role in both nutrient cycling and energy flows.

A set of indicators has been identified for which site-specific criteria will be used to determine if this standard is being met.

Potential Indicators

Photosynthesis is effectively occurring throughout the potential growing season, consistent with the potential/capability of the site, as evidenced by plant composition and community structure.

Nutrient cycling is occurring effectively, consistent with the potential/capability of the site, as evidenced by:

° plant composition and community structure;
° accumulation, distribution, incorporation of plant litter and organic matter into the soil;
° animal community structure and composition;
° root occupancy in the soil profile; and
° biological activity including plant growth, herbivory, and rodent, insect and microbial activity.

Standard 4 Water Quality

Surface water and groundwater quality, influenced by agency actions, complies with State water quality standards.

Rationale and Intent

The quality of the water yielded by a watershed is determined by the physical and chemical properties of the geology and soils unique to the watershed, the prevailing climate and weather patterns, current resource conditions, the uses to which the land is put and the quality of the management of those uses. Standards 1, 2 and 3 contribute to attaining this standard.

States are legally required to establish water quality standards and Federal land management agencies are to comply with those standards. In mixed ownership watersheds, agencies, like any other land owners, have limited influence on the quality of the water yielded by the watershed. The actions taken by the agency will contribute to meeting State water quality standards during the period that water crosses agency administered holdings.

Potential Indicators

Water quality meets applicable water quality standards as evidenced by:

° water temperature;
° dissolved oxygen;
° fecal coliform;
° turbidity;
° pH;

° populations of aquatic organisms; and
° effects on beneficial uses (i.e., effects of management activities on beneficial uses as defined under the Clean Water Act and State implementing regulations).

Standard 5 Native, T&E, and Locally Important Species

Habitats support healthy, productive and diverse populations and communities of native plants and animals (including special status species and species of local importance) appropriate to soil, climate and landform.

Rationale and Intent

Federal agencies are mandated to protect threatened and endangered species and will take appropriate action to avoid the listing of any species. This standard focuses on retaining and restoring native plant and animal (including fish) species, populations and communities (including threatened, endangered and other special status species and species of local importance). In meeting the standard, native plant communities and animal habitats would be spatially distributed across the landscape with a density and frequency of species suitable to ensure reproductive capability and sustainability. Plant populations and communities would exhibit a range of age classes necessary to sustain recruitment and mortality fluctuations.

Potential Indicators

Essential habitat elements for species, populations and communities are present and available, consistent with the potential/capability of the landscape, as evidenced by:

° plant community composition, age class distribution, productivity;
° animal community composition, productivity;
° habitat elements;
° spatial distribution of habitat;
° habitat connectivity; and
° population stability/resilience

Sage-Grouse Management Guidelines

Guidelines for Livestock Grazing Management

Guidelines for livestock grazing management offer guidance in achieving plan goals, meeting standards for rangeland health and fulfilling the fundamentals of rangeland health. Guidelines are applied in accordance with the capabilities of the resource in consultation, cooperation, and coordination with permittees/lessees and the interested public. Guidelines enable managers to

adjust grazing management on public lands to meet current and anticipated climatic and biological conditions.

General Guidelines

1. Involve diverse interests in rangeland assessment, planning and monitoring.

2. Assessment and monitoring are essential to the management of rangelands, especially in areas where resource problems exist or issues arise. Monitoring should proceed using a qualitative method of assessment to identify critical, site-specific problems or issues using interdisciplinary teams of specialists, managers, and knowledgeable land users.

Once identified, critical, site-specific problems or issues should be targeted for more intensive, quantitative monitoring or investigation. Priority for monitoring and treatment should be given to those areas that are ecologically at-risk where benefits can be maximized given existing budgets and other resources.

Livestock Grazing Management

1. The season, timing, frequency, duration and intensity of livestock grazing use should be based on the physical and biological characteristics of the site and the management unit in order to:

   a. provide adequate cover (live plants, plant litter and residue) to promote infiltration, conserve soil moisture and to maintain soil stability in upland areas;

   b. provide adequate cover and plant community structure to promote streambank stability, debris and sediment capture, and floodwater energy dissipation in riparian areas.

   c. promote soil surface conditions that support infiltration;

   d. avoid sub-surface soil compaction that retards the movement of water in the soil profile;

   e. help prevent the increase and spread of noxious weeds;

   f. maintain or restore diverse plant populations and communities that fully occupy the potential rooting volume of the soil;

   g. maintain or restore plant communities to promote photosynthesis throughout the potential growing season;

   h. promote soil and site conditions that provide the opportunity for the

establishment of desirable plants;

i. protect or restore water quality; and

j. provide for the life cycle requirements, and maintain or restore the habitat elements of native (including T&E, special status, and locally important species) and desired plants and animals.

2. Grazing management plans should be tailored to site-specific conditions and plan objectives. Livestock grazing should be coordinated with the timing of precipitation, plant growth and plant form. Soil moisture, plant growth stage and the timing of peak stream flows are key factors in determining when to graze. Response to different grazing strategies varies with differing ecological sites.

3. Grazing management systems should consider nutritional and herd health requirements of the livestock.

4. Integrate grazing management systems into the year-round management strategy and resources of the permittee(s) or lessee(s). Consider the use of collaborative approaches (e.g., Coordinated Resource Management, Working Groups) in this integration.

5. Consider competition for forage and browse among livestock, big game animals, and wild horses in designing and implementing a grazing plan.

6. Provide periodic rest from grazing for rangeland vegetation during critical growth periods to promote plant vigor, reproduction and productivity.

7. Range improvement practices should be prioritized to promote rehabilitation and resolve grazing concerns on transitory grazing land.

8. Consider the potential for conflict between grazing use on public land and adjoining land uses in the design and implementation of a grazing management plan.

Facilitating the Management of Livestock Grazing

1. The use of practices to facilitate the implementation of grazing systems should consider the kind and class of animals managed, indigenous wildlife, wild horses, the terrain and the availability of water. Practices such as fencing, herding, water development, and the placement of salt and supplements (where authorized) are used where appropriate to:

   a. promote livestock distribution;

b. encourage a uniform level of proper grazing use throughout the grazing unit;

c. avoid unwanted or damaging concentrations of livestock on streambanks, in riparian areas and other sensitive areas such as highly erodible soils, unique wildlife habitats and plant communities; and

d. protect water quality.

2. Roads and trails used to facilitate livestock grazing are constructed and maintained in a manner that minimizes the effects on landscape hydrology; concentration of overland flow, erosion and sediment transport are prevented; and subsurface flows are retained.

Accelerating Rangeland Recovery

1. Upland treatments that alter the vegetative composition of a site, like prescribed burning, juniper management and seedings or plantings must be based on the potential of the site and should:

   a. retain or promote infiltration, permeability, and soil moisture storage;

   b. contribute to nutrient cycling and energy flow;

   c. protect water quality;

   d. help prevent the increase and spread of noxious weeds;

   e. contribute to the diversity of plant communities, and plant community composition and structure;

   f. support the conservation of T&E, other special status species and species of local importance; and

   g. be followed up with grazing management and other treatments that extend the life of the treatment and address the cause of the original treatment need.

2. Seedings and plantings of non-native vegetation should only be used in those cases where native species are not available in sufficient quantities; where native species are incapable of maintaining or achieving the standards; or where non-native species are essential to the functional integrity of the site.

3. Structural and vegetative treatments and animal introductions in riparian and wetland areas must be compatible with the capability of the site, including the system's hydrologic regime, and contribute to the maintenance or restoration of

properly functioning condition.

Glossary

Appropriate action-implementing actions pursuant to subparts 4110, 4120, 4130 and 4160 of the regulations that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with the guidelines. (see **Significant progress**)

Assessment-a form of evaluation based on the standards of rangeland health, conducted by an interdisciplinary team at the appropriate landscape scale (pasture, allotment, sub-watershed, watershed, etc.) to determine conditions relative to standards.

Compaction layer-a layer within the soil profile in which the soil particles have been rearranged to decrease void space, thereby increasing soil bulk density and often reducing permeability.

Crust, Abiotic-(physical crust) a surface layer on soils, ranging in thickness from a few millimeters to a few centimeters, that is much more compact, hard and brittle, when dry, than the material immediately beneath it.

Crust, Biotic-(microbiotic or cryptogamic crust) a layer of living organisms (mosses, lichens, liverworts, algae, fungi, bacteria, and/or cyanobacteria) occurring on, or near the soil surface.

Degree of function-a level of physical function relative to properly functioning condition commonly expressed as: properly functioning, functioning-at-risk, or non-functional.

Diversity-the aggregate of species assemblages (communities), individual species, and the genetic variation within species and the processes by which these components interact within and among themselves. The elements of diversity are: 1. community diversity (habitat, ecosystem), 2. species diversity; and 3. genetic diversity within a species; all three of which change over time.

Energy flow-the processes in which solar energy is converted to chemical energy through photosynthesis and passed through the food chain until it is eventually dispersed through respiration and decomposition.

Groundwater-water in the ground that is in the zone of saturation; water in the ground that exists at, or below the water table.

Guideline-practices, methods, techniques and considerations used to ensure that progress is made in a way and at a rate that achieves the standard(s).

Gully-a channel resulting from erosion and caused by the concentrated but intermittent flow of water usually during and immediately following heavy rains.

Hydrologic cycle-the process in which water enters the atmosphere through evaporation, transpiration, or sublimation from the oceans, other surface water bodies, or from the land and vegetation, and through condensation and precipitation returns to the earth's surface. The precipitation then occurring as overland flow, stream flow, or percolating underground flow to the oceans or other surface water bodies or to other sites of evapo-transpiration and recirculation to the atmosphere.

Indicators-parameters of ecosystem function that are observed, assessed, measured, or monitored to directly or indirectly determine attainment of a standard(s).

Infiltration-the downward entry of water into the soil.

Infiltration rate-the rate at which water enters the soil.

Nutrient cycling-the movement of essential elements and inorganic compounds between the reservoir pool (soil, for example) and the cycling pool (organisms) in the rapid exchange (i.e., moving back and forth) between organisms and their immediate environment.

Organic matter-plant and animal residues accumulated or deposited at the soil surface; the organic fraction of the soil that includes plant and animal residues at various stages of decomposition; cells and tissues of soil organisms, and the substances synthesized by the soil population.

Permeability-the ease with which gases, liquids or plant roots penetrate or pass through a bulk mass of soil or a layer of soil.

Properly functioning condition-Riparian-wetland: adequate vegetation, landform, or large (coarse) woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid in flood plain development; improve flood-water retention and ground water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse channel and ponding characteristics to provide the habitat and water depth, duration and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The result of interaction among geology, soil, water, and vegetation.

Uplands: soil and plant conditions support the physical processes of infiltration and moisture storage and promote soil stability (as appropriate to site potential); includes the production of plant cover and the accumulation of plant residue that protect the soil surface from raindrop impact, moderate soil temperature in minimizing frozen soil conditions (frequency, depth, and duration), and the loss of soil moisture to evaporation; root growth and development in the support of permeability and soil aeration. The result of interaction among geology, climate, landform, soil, and organisms.

Proper grazing use-grazing that, through the control of timing, frequency, intensity and duration of use, meets the physiological needs of the desirable vegetation, provides for the establishment of desirable plants and is in accord with the physical function and stability of soil and landform (properly functioning condition).

Reference area-sites that, because of their condition and degree of function, represent the ecological potential or capability of similar sites in an area or region (ecological province); serve as a benchmark in determining the ecological potential of sites with similar soil, climatic, and landscape characteristics.

Rill-a small, intermittent water course with steep sides; usually only a few inches deep.

Riparian area-a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and stream, glacial potholes, and shores of lakes and reservoirs with stable water levels area typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil. Includes, but is not limited to, jurisdictional wetlands.

Significant progress-when used in reference to achieving a standard: (actions), the necessary land treatments, practices and/or changes to management have been applied or are in effect; (rate), a rate of progress that is consistent with the anticipated recovery rate described in plan objectives, with due recognition of the effects of climatic extremes (drought, flooding, etc.), fire, and other unforeseen naturally occurring events or disturbances. Monitoring reference areas that are ungrazed and properly grazed may provide evidence of appropriate recovery rates. (See Proper Grazing Use)

Soil density-(bulk density)-the mass of dry soil per unit bulk volume.

Soil moisture-water contained in the soil; commonly used to describe water in the soil above the water table.

Special status species-species proposed for listing, officially listed (T/E), or candidates for listing as threatened or endangered by the Secretary of the Interior under the provisions of the Endangered Species Act; those listed or proposed for listing by the State in a category implying potential endangerment or extinction; those designated by each Bureau of Land Management State Director as sensitive.

Species of local importance-species of significant importance to Native American populations (e.g., medicinal and food plants).

Standard-an expression of the physical and biological condition or degree of function necessary to sustain healthy rangeland ecosystems.

Uplands-lands that exist above the riparian/wetland area, or active flood plains of rivers and streams; those lands not influenced by the water table or by free or unbound water; commonly represented by toe slopes, alluvial fans, and side slopes, shoulders and ridges of mountains and hills.

Watershed-an area of land that contributes to the surface flow of water past a given point. The watershed dimensions are determined by the point past, or through which, runoff flows.

Watershed function-the principal functions of a watershed include the capture of moisture contributed by precipitation; the storage of moisture within the soil profile, and the release of moisture through subsurface flow, deep percolation to groundwater, evaporation from the soil, and transpiration by live vegetation.

Wetland-areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.



Appendix M. Areas of Critical Environmental Concern

This appendix provides detailed information about Areas of Critical Environmental Concern.

In this appendix:

Areas of Critical Environmental Concern 1307

Appendix M. Areas of Critical Environmental Concern

Areas of Critical Environmental Concern

This section contains detailed information about Areas of Critical Environmental Concern (ACEC). Two tables are included. Table 285 shows Areas of Critical Environmental Concern by Alternative. It includes information about the categories of Relevant and Important Values and any management direction that applies to the area and contains more specific information about the Relevant and Important Values for each ACEC.

The ACEC's denoted by gray shading are those that were not further analyzed for designation under the action alternatives because they did not meet relevance and importance criteria and/or do not need special management attention. Management direction for these areas is the management direction in the current plans, and would only be applied under the no action alternative.

Table 285. Areas of Critical Environmental Concern.

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
1	SALEM	Beaver Creek	Potential	44	no	no	no	Natural processes	NA	NA	NA	NA
2		Crabtree Complex RNA/ ONA	Existing	1,231	yes	yes_ without_ OC*	yes_ without_ OC	Scenic, natural processes, fish and wildlife	Closed	Open - No Surface Occupancy	Proposed Closed	None
3		Elk Creek	Existing	784	no	yes	no	Fish and wildlife	Closed	Open - No Surface Occupancy	Proposed Closed	Some thinning in stands <80 yrs old
4		Forest Peak RNA	Existing	155	yes	yes	yes	Natural processes, fish and wildlife	Closed	Open - No Surface Occupancy	Proposed Closed	None
5		Grass Mountain RNA	Existing	930	yes	yes	yes	Scenic, natural processes, fish and wildlife	Closed	Open - No Surface Occupancy	Proposed Closed	None
6		High Peak - Moon Creek RNA	Existing	1,490	yes	yes	yes	Natural processes, fish and wildlife	Closed	Open - No Surface Occupancy	Proposed Closed	None
7		Jackson Bend	Existing	15	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
8		Little Grass Mountain	Existing	80				Scenic, natural processes, fish and wildlife	Closed	Open - No Surface Occupancy	Proposed Closed	None
9		Little North Fork Wilson River	Potential	1,822	yes	yes_ without_ OC	yes	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Some management of previously entered stands.
10		Little Sink	Existing	81	yes	yes	yes	Fish and wildlife, natural processes, natural hazards	Closed	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
11	SALEM	Lost Prairie	Existing	61	yes	yes	yes	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
12		Lower Scappoose Eagle	Potential	179	yes_ without_ OC	no	no	Fish and wildlife	Closed	Open - No Surface Occupancy	Proposed Closed	None
13		Marys Peak ONA	Existing	353	yes	yes	no	Scenic, natural processes, fish and wildlife	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
14		Marys Peak B	Potential	75	yes	yes	yes	Scenic, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
15		McCully Mountain	Potential	101	no	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
16		Middle Santiam Terrace	Existing	182	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
17		Mill Creek Ridge	Potential	114	yes	yes	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
18		Molalla Meadows	Potential	205	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
19		Nestucca River	Existing	1,163	no	yes	no	Scenic, fish and wildlife	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
20		North Santiam	Existing	15	no	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
21		Rickreall Ridge	Existing	368	yes	yes	yes_ without_ OC	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
22	SALEM	Saddleback Mountain RNA	Existing	300	yes	yes	yes	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
23		Sandy River Gorge ONA	Existing	9,780	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Scenic, cultural, historic values, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Permitted within some portions
24		Sheridan Peak	Existing	310				Natural processes	Closed	Open - No Surface Occupancy	Open with additional restrictions	Some thinning in stands <110 yrs old
25		Silt Creek	Potential	140	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Natural processes, natural hazards	Closed	Open - No Surface Occupancy	Proposed Closed	None
26		Snow Peak	Potential	1,667	no	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
27		Soosap Meadows	Existing	343	yes	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
28		The Butte RNA	Existing	39	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
29		Valley of the Giants ONA	Existing	1,311	yes	yes	no	Scenic, natural processes, fish and wildlife	Closed	Minerals not federally administered	Minerals not federally administered	None
30		Walker Flat	Existing	11	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
31		Waterloo	Potential	9	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
32	SALEM	Wells Island	Potential	73	no	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
33		White Rock Fen	Existing	55	yes	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
34		Wilhoit Springs	Existing	133	no	no	no	Natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
35		Williams Lake	Existing	90	no	no	no	Natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
36		Yampo	Existing	13	yes	yes	yes	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
37		Yaquina Head ONA	Existing	91	yes	yes	yes	Scenic, cultural, historic values, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
38	EUGENE	Camas Swale RNA	Existing	308	yes	yes	yes	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
39		Coburg Hills RFI	Existing	855	no	no	no	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential selective harvest/ silvicultural prescriptions
40		Cottage Grove Lake RFI	Existing	15	no	yes	no	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential selective harvest/ silvicultural prescriptions

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
41	EUGENE	Cottage Grove Old Growth	Existing	80				Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
42		Cougar Mountain Yew Grove	Existing	90	no	no	no	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential selective harvest/ silvicultural prescriptions and Conifer removal to maintain grassland
43		Dorena Lake RFI	Existing	18	no	no	no	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential selective harvest/ silvicultural prescriptions
44		Dorena Prairie	Potential	8	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential conifer removal to maintain prairie
45		Esmond Lake	Potential	86	no	yes_ without_ OC	yes_ without_ OC	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
46		Fox Hollow RNA	Existing	159	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
47		Grassy Mountain	Existing	74	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Scenic, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential conifer removal to maintain grassland

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
48	EUGENE	Heceta Sand Dunes ONA	Existing	210	yes	yes	yes	Scenic, natural processes	Open/Closed	Open - No Surface Occupancy	Closed	None
49		Horse Rock Ridge RNA	Existing	378	yes	yes	yes	Scenic, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential conifer removal to maintain grassland
50		Hult Marsh	Existing	177	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Scenic, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
51		Lake Creek Falls	Existing	54				Scenic, natural hazard	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
52		Lorane Ponderosa Pine	Potential	104	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Closed	Potential selective harvest/ silvicultural prescriptions
53		Low Elevation Headwaters of the McKenzie River	Potential	9,765	no	no	no	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	Permitted if consistent with ACEC values
54		McGowan Meadow	Potential	75	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential conifer removal to maintain grassland
55		Mohawk RNA	Existing	290	yes	yes	yes	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
56	EUGENE	Oak Basin Prairies	Potential	223	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential selective harvest/ silvicultural prescriptions and Conifer removal to maintain grassland
57		Taylor Creek	Potential	155	no	no	no	Fish and wildlife	Closed	Open - No Surface Occupancy	Proposed Closed	Potential selective harvest/ silvicultural prescriptions
58		Upper Elk Meadows RNA	Existing	217	yes	yes	yes	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
59		Willamette Valley Prairie/ Oak and Pine Area	Potential	1,486	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Potential selective harvest/ silvicultural prescriptions and Conifer removal to maintain grassland
60	ROSEBURG	Bear Gulch RNA	Existing	351	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
61		Beatty Creek RNA	Existing	864	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
62		Bushnell-Irwin Rocks RNA	Existing	1,085	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
63	ROSEBURG	Callahan Meadows	Potential	34	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
64		China Ditch	Potential	60	no	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
65		Myrtle Island RNA	Existing	19	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
66		North Bank	Existing	6,162	yes	yes	yes	Cultural, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
67		North Myrtle Creek RNA	Existing	453	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
68		North Umpqua River	Existing	1,791				Scenic, fish and wildlife	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
69		Red Pond RNA	Existing	141	yes	yes	yes	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
70		Stouts Creek	Potential	64	no	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
71		Tater Hill RNA	Existing	303	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
72		Umpqua River Wildlife Area	Existing	855	no	no	no	Fish and wildlife	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
73	COOS BAY	Brownson Ridge	Potential	399	no	no	no	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
74		Cherry Creek RNA	Existing	592	yes	yes	yes	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
75		China Wall	Existing	302	yes	yes	yes_ without_ OC	Cultural, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
76		Euphoria Ridge	Potential	241	no	no	no	Cultural, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
77		Hunter Creek Bog	Existing	721	yes	yes	yes	Natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
78		New River	Existing	876	yes	yes	yes	Cultural, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
79		North Fork Chetco	Existing	603	yes	yes	yes	Cultural, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
80		North Fork Coquille River	Existing	311	yes	yes_ without_ OC	no	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
81		North Fork Hunter Creek	Existing	1,757	yes	yes	yes	Cultural, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
82		North Spit	Existing	682	yes	yes	yes	Cultural, scenic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
83	COOS BAY	Rocky Peak	Potential	1,827	yes	yes	yes	Cultural, scenic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
84		Roman Nose	Potential	205	yes	yes	yes_ without_ OC	Natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
85		Steel Creek	Potential	1,381	yes_ without_ OC	yes_ without_ OC	no	Historic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
86		Tioga Creek	Existing	42	yes	yes	no	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
87		Upper Rock Creek	Existing	472	yes	no	no	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
88		Wassen Creek	Existing	3,394	yes	no	no	Scenic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
89	MEDFORD	Baker Cypress	Existing	11	no	no	no	Scenic, cultural, natural processes	Limited to designated roads	Open - No Surface Occupancy	Open	None
90		Bobby Creek RNA	Existing	1,915	yes	yes	yes	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
91		Brewer Spruce RNA	Existing	1,707	yes	yes	yes	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
92		Cobleigh Road	Potential	261	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
93	MEDFORD	Crooks Creek	Existing	147	no	yes	no	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
94		Dakubetede Wildland	Potential	1,796	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
95		East Fork Whiskey Creek	Potential	3,188	no	yes	no	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
96		Eight Dollar Mountain	Existing	1,249	yes	yes	yes	Natural processes	Limited to designated roads	Open - No Surface Occupancy	Open	None
97		French Flat	Existing	651	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Cultural, natural processes	Closed	Open - No Surface Occupancy	Open	None
98		Grayback Glades RNA	Existing	1,022	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
99		Hole-In-The-Rock	Existing	63	no	no	no	Scenic, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
100		Holton Creek RNA	Existing	421	yes	yes	yes	Scenic, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
101		Hoxie Creek	Existing	255	no	no	no	Scenic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
102		Iron Creek	Existing	286				Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
103		Jenny Creek	Existing	966				Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
104	MEDFORD	King Mountain Rock Garden	Existing	68	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Natural processes	Limited to designated roads	Open - No Surface Occupancy	Open	None
105		Long Gulch	Potential	1,020	no	no	no	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	Density management for ACEC values
106		Lost Lake RNA	Existing	387	yes	yes	yes	Scenic, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
107		Moon Prairie	Existing	92	no	no	no	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Open	None
108		North Fork Silver Creek RNA	Existing	499	yes	yes	yes	Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
109		Oregon Gulch RNA	Existing	1,051	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
110		Pickett Creek	Potential	32	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
111		Pilot Rock	Existing	544				Fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
112		Pipe Fork RNA	Existing	516	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
113		Poverty Flat	Existing	29	yes	yes	yes	Natural processes	Limited to designated roads	Open - No Surface Occupancy	Open	None
114		Reeves Creek	Potential	117	no	no	no	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
115	MEDFORD	Rough and Ready	Existing	1,189	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Natural processes	Limited to designated roads	Open - No Surface Occupancy	Open	None
116		Round Top Butte RNA	Existing	605	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
117		Scotch Creek RNA	Existing	1,799	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
118		Sterling Mine Ditch	Existing	143	no	no	no	Cultural, historic	Closed	Open - No Surface Occupancy	Open	None
119		Table Rocks ONA	Existing	1,244	yes	yes	yes	Scenic, natural processes	Closed	Open - No Surface Occupancy	Open	None
120		Tin Cup	Existing	83	no	no	no	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Open	None
121		Waldo-Takilma	Potential	1,760	yes	yes	yes	Historic, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
122		Woodcock Bog RNA	Existing	265	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
123	KLAMATH	Bumpheads	Potential	112	yes	yes	yes	Scenic, cultural, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
124		Four Mile Wetland	Potential	1,173	yes	yes	yes	Scenic, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
125		Miller Creek	Existing	939	yes	yes	yes	Scenic, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None

Map #	District	ACEC Name	Status	Total Area (Acres)	Alt 1	Alt 2	Alt 3	Relevant and Important Value Category	Management Direction If Designated			
									Off-Highway Vehicle Desig.	Leasable Mineral Entry	Locatable/ Salable Mineral Entry	Timber Harvest
126	KLAMATH	Old Baldy RNA	Existing	355	yes	yes	yes	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
127		Tunnel Creek	Potential	72	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
128		Upper Klamath River	Existing	5,092	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Historic, cultural, scenic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	Forest health treaments
129		Upper Klamath River Addition	Potential	910	yes_ without_ OC	yes_ without_ OC	yes_ without_ OC	Historic, cultural, scenic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	Forest health treaments
130		Wood River Wetland	Existing	3,225	yes	yes	yes	Cultural, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
131		Yainax Butte	Existing	707	yes	yes	yes	Cultural, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None

***yes_without_OC = area would be designated without the O&C timber harvest base acres included.**

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
1	SALEM	Beaver Creek	Potential			Natural system associated with mid-elevation oak meadow and native prairie flora seldom seen along the western slopes of the northern Cascades in Oregon. Contributes to the regional oak meadow network as described in the Nature Conservancy's nomination letter (dated 01/06/2006) and the Willamette Valley-Puget Trough-Georgia Basin, Ecoregional Assessment.	
2		Crabtree Complex RNA/ ONA	Existing	Scenic values for this area are high in the immediate vicinity. Scenic qualities such as forest cover type, complex of habitats and geologic features are considered exceptional within the Salem District.	The relatively undisturbed forest is used by northern spotted owls (FT). Cliffs provide unique habitat with potential for raptor use. Evening fieldslug (Derocerus Hesperium) (BSO), northern goshawk (BSO), Cascades torrent salamander (BAO) have all been documented within the ACEC.	West Cascades, Oregon Ecoregion Cells: Western hemlock/devil's club and old-growth western redcedar types. Evidence of glaciation along with a relatively undisturbed old-growth forest at a relatively low elevation contributes to relevance for natural systems at this site. This area has a population of Alaska-cedar which is fairly uncommon in this region. Rare botanical species reported from this area include: Phaeocollybia californica (BSO)	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
3	SALEM	Elk Creek	Existing		An ACEC since 1980, it was originally established for management of rare inland bald eagle (FT) nest site. In addition to continued use by eagles, also contains a known marbled murrelet site and an historic spotted owl site. The ACEC is a rare northern coast range example of a relatively large contiguous block of old forest that contains excellent habitat for all three of these species, and is expected to continue to contribute to their recovery. Elk Creek is also considered to be the most important and biologically complex tributary to the Nestucca River system because Oregon Coastal coho (BSO), chinook, summer and winter steelhead (FC), sea-run and resident cutthroat trout and Pacific lamprey all spawn in this stream.	This contiguous block of old forest is a rare example of a fully functional natural system in the north Oregon Coast Range as evidenced by the extensive list of late-successional forest dependent species that occur there. While there are other patches of old forest in the northern coast range, few are of the size and contiguity of the Elk Creek area while also remaining relatively undisturbed.	
4		Forest Peak RNA	Existing		Undisturbed valley margin meadows are rare in this vicinity. This meadow may provide habitat for several rare invertebrate species including: Fender's blue butterfly (FT), Taylor's checkerspot (FC), and Siskiyou grasshopper (BSO). This meadow also offers habitat for declining willamette valley songbirds, including common nighthawk (BSO), Oregon vesper sparrow (BSO), western bluebird, and acorn woodpecker.	Willamette Vallley Ecoregion cells: Douglas-fir/poison oak forest, Douglas-fir/bigleaf maple forest with some grand fir , Lemmon's needlegrass-moss bald. Valley margin cell\, undisturbed 3rd order stream in valley fringe. Cimicifuga elata (BSO)	
5		Grass Mountain RNA	Existing	Scenic	High elevation grassy bald habitat is juxaposed with mature noble fir and forest and offers undisturbed refugia for rare and endemic invertebrate species including an un-named blind ground beetle. The older forest stands have a long history of use and offer nesting habitat for spotted owls (FT) and marbled murrelets (FT)	Coast Range Ecoregion Cells: Noble fir-western hemlock forest, Grass bald on Coast Range mountain. Meets the needs of a high elevation noble fir and grass meadow community and an undisturbed 3rd order stream system.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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6	SALEM	High Peak - Moon Creek RNA	Existing		The Moon Creek ACEC contains active northern spotted owl (FT) and marbled murrelet (FT) sites. The area is comprised of contiguous late-successional forest habitat that is relatively inaccessible and undisturbed within a very steep canyon that is ideal for supporting owls and murrelets. Elevations within the ACEC range from over 2800 feet on High Peak to about 600 feet on Moon Creek itself. Trees as much as 500 years old are found there. One of the few remaining relatively large contiguous blocks of old forest found in north Oregon coast range. Moon Creek is also high quality habitat for anadromous fish of regional significance, including Oregon Coastal coho (BSO) and steelhead (FC on BLM list).	Rare example of northern Oregon coast range old-growth forest with intact functioning late-successional forest system. Coast Range Ecoregion Cells: Western hemlock/ swordfern, Western hemlock/vine maple-salal. Douglas-fir/sword fern community natural processes also for riparian hardwoods/streamside forest on third to fifth order stream at low elevation.	
7		Jackson Bend	Existing		Roosting and nesting sites for bald eagle (FT), great blue heron and osprey are documented within this ACEC.	This parcel is on the banks of and within the floodplain of the Willamette River. The entire area is seasonally flooded during high water events. Very little land of this type is in Federal ownership and the habitat in this parcel is unique from all other BLM lands in NW Oregon.	
8		Little Grass Mountain	Existing	scenic vistas	Example of grassy bald habitat adjacent to mature conifer forest. Rare or endemic invertebrate species are possible.	Grass balds are uncommon in the Oregon Coast Range Mountains. There are no specific values within this area that sets it apart from other grassy balds that are not designated as ACECs.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
9	SALEM	Little North Fork Wilson River	Potential		High quality habitat and known sites for northern spotted owl (FT), marbled murrelet (FT) and bald eagle (FT) exists within the potential Little North Fork Wilson River ACEC. All three species have nested either now or in the recent past within the area. Due to its inaccessibility, ruggedness, lack of fragmentation, and proximity to highly managed state and private forest lands, this area is one of the few remaining areas in the northern coast range where late-successional dependent species exist largely undisturbed. The Little North Fork Wilson River is also a tier 1 key watershed and supports 5 salmonid species including coastal winter steelhead (FC), Oregon Coast coho (BSO) and chum salmon, and is the only stream on BLM managed lands in the northern coast range that supports chum salmon.	Intact old-growth conifer riparian habitat is rare throughout the state of Oregon and is especially rare in coastal ecosystems. This potential ACEC contains old-growth components in a biologically diverse and natural condition not only within the riparian areas but throughout the adjacent slopes and tributary drainages as well. A relict old-growth plant community of Douglas-fir, Sitka spruce, Western hemlock, and Western redcedar that is approximately 450 years old within the canyon of the Little North Fork of the Wilson River. The riparian plant community is essentially natural, having large conifers shading and contributing downed material to the river system.	
10		Little Sink RNA	Existing		Parcel provides excellent example of low elevation coast range old-growth forest adjacent to Willamette Valley margin. Ponds support healthy populations of native amphibians (no bullfrogs). Potential release site for western pond turle. Historic nest site for spotted owl (FT). Refugia for invertebrate species, with potential presence of Johnson's hairstreak (BSO), spotted taildropper slug (BSO), and other uncommon mollusks.	Willamette Valley Ecoregion Cells: Douglas-fir grand fir/ vine maple -salal, Slump pond at margin of valley, with aquatic beds and marshy shore. "Instant Study (wilderness) Area in the foothills of the Willamette Valley. Rare botanical species reported from this location include: Wolffia columbiana (BAO) and Wolffia boraelis (BAO).	The past slumping soils or unstable ground at Little Sink has created at least 3 distinct ponds.

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
11	SALEM	Lost Prairie	Existing		Large bog and wetland habitat supports a diverse assemblage of uncommon invetebrate species, which may include: evening field slug (BSO), crowned tightcoil snail (BSO), and spotted tail-dropper slug (BSO). Site also offers nesting habitat for songbirds, such as the olive-sided flycatcher, western bluebird, and willow flycatcher.	Unique high elevation sphagnum bog and associated species located in the northern Oregon Coast Range. Rare botanical species reported from Lost Prairie ACEC include: Fritillaria camschatcensis (BAO), Erythronium elegans (STO), Anemone oregana var. felix (BAO), Tetraplodon mnioides (BAO).	
12		Lower Scappoose Eagle	Potential		Lower Scappoose Eagle PACEC includes an active and productive bald eagle (FT) nest site and a communal winter roost, a circumstance that is highly unusual. Surrounded by private industrial forestland and expanding urban areas, this site provides refuge for eagles due to its relative inaccessibility and ruggedness and has contributed to the resurgence of eagle numbers in the lower Columbia River recovery zone.		
13		Marys Peak ONA	Existing	Marys Peak is the highest mountain in the Oregon Coast Range Mountains.	This unique high elevation grassy bald habitat is juxaposed with mature and old-growth forests and is known to support populations of several rare or endemic invertebrates including: Haddocks caddisfly (BSO), and Roth's blind ground beetle (BSO). The older forest stands have a long history of use and offer nesting habitat for spotted owls (FT) and marbled murrelets (FT).	Marys Peak is the highest mountain in the Oregon Coast Range Mountains. Special habitats or natural values include: high elevation grass meadows, noble fir community, shallow soils with 'rock garden' plants.	
14		Marys Peak B	Potential	High scenic values in the immediate vicinity.	Uncommon or endemic invertebrates are possible in high elevation tributaries of Parker Creek, including the Haddock's caddisfly (BSO). The older forest stands have a long history of use and offer nesting habitat for spotted owls (FT) and marbled murrelets (FT).	Marys Peak Parcel B includes a high elevation Coast Range old-growth forest with a noble fir component, which is rare.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
15	SALEM	McCully Mountain	Potential			Natural system associated with mid-elevation oak meadow and native prairie flora seldom seen along the western slopes of the northern Cascades in Oregon. Importance is met through regional interest in oak habitats within and adjacent to the Willamette valley. Contributes to the regional oak meadow network as described in the Nature Conservancies nomination letter (dated 01/06/2006) and the Willamette Valley-Puget Trough-Georgia Basin, Ecoregional Assessment. The McCully Mountain PACEC meets regional significance based on the limited number of mid-elevation oak meadows that remain intact. Potential for nesting raptors, use by Neotropical Migratory birds and occurrence of wildlife species associated with older forest.	
16		Middle Santiam Terrace	Existing	A Native Amarican cultural site at this location is one of few in the region on public lands.		Old-growth fir and hemlock forest at a relatively low elevation river terrace. Habitat of this type is relatively unique and has an increased value as a research site. All forest surrounding this ACEC is privately owned and has been previously logged, leaving this as the last remaining natural habitat in a matrix of young managed forests.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
17	SALEM	Mill Creek Ridge	Potential			Oregon white oak community in NW Oregon on east slopes of the Coast Range. Rare valley margin oak habitat juxaposed with coast range conifer forests is likely to support great diversity of uncommon or endemic invertebrate species, and provide nesting habitat for declinging willamette valley songbirds, including common nighthawk (BSO), western bluebird, and white-breasted nuthatch.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
18	SALEM	Molalla Meadows	Potential	The river corridor has a high level of public use and meets relevance criteria for both recreation and scenic values. The Molalla River has been found to be both eligible and suitable for inclusion into the National Wild and Scenic River (WSR) System for outstandingly remarkable values that include geology, scenic and recreation. The general area including the PACEC has been recognized for both its scenic and recreation values and has been designated a BLM Special Recreation Management Area. While there may be some overlap between the WSR and the PACEC boundaries, the protections and guidance provided under WSR guidance are interim unless the river is actually added to the WSR System by Congress. In addition, the interim guidance only addresses management within a 1/4-mile of either side of the Molalla River. As long as any management prescriptions for the PACEC met WSR interim guidance, these would be complimentary not competing designations.	The area meets relevance for Wildlife Resources due to presence of raptor nests, use by Neotropical Migratory birds and occurrence of wildlife species associated with older forest. Golden eagles, Oregon slender salamander (BSO), harlequin duck (BAO), and band-tailed pigeon (Continental/Regional Species of Concern) occur here.	The meadows represent a unique ecotype with natural systems and geologic features seldom seen on BLM lands in the Salem District. The oak meadows represent a rare transition from valley oak savannas' to upland conifer forests. This site contributes to the regional oak meadow network as described in the Nature Conservancies nomination letter (dated 01/06/2006) and the Willamette Valley-Puget Trough-Georgia Basin, Ecoregional Assessment. The oak meadow at this site are the largest of this habitat type under BLM ownership in the Cascades Range, within the Salem District.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
19	SALEM	Nestucca River	Existing	Designated State scenic waterway & BLM backcountry byway. The upper Nestucca River is eligible for inclusion in National Wild & Scenic River system (recreational designation). The river corridor is designated VRM 1.	The Nestucca River corridor includes high quality nesting, roosting and foraging habitat for bald eagles (FT) and marbled murrelets (FT). The river provides important connectivity to other high quality habitat areas, most notably the Elk Creek drainage and ACEC. Marbled murrelets are known to use the river corridor to access nesting habitat within the drainage. The Nestucca River is also a high quality anadromous fish stream and contributes significantly to wild fish production on the north Oregon Coast. Oregon Coastal coho (BSO) , chinook, summer and winter steelhead (FC), sea-run and resident cutthroat trout and Pacific lamprey are all present.		
20		North Santiam	Existing			Represents a natural system not common in the region. The primary natural system operating in the area are the relatively undisturbed river meander channels which are rare and sensitive to additional disturbance. This area contributes to the habitat used by species in combination with Kingston prairie and Stout Mountain (adjacent areas with unique values). Existing alluvial forest provides potential nesting and roosting habitat for resident and migratory birds. With its unique habitat this area contributes to overall RNA values for this habitat type but it is not large enough to meet the needs of the RNA cell.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
21	SALEM	Rickreall Ridge	Existing			Rocky "hogback" ridge, steep talus slopes and unique vegetation in the Oregon Coast Range Mountains. Rickreall Ridge has a disjunct flora as the vegetation is similar to vegetation known from the Cascade Mountain Range. High elevation rocky outcrops and adjoining older forest support a diversity of rare or endemic invertebrate species, including Johnson's hairstreak (BSO), and spotted tail-dropper (BSO). Older forest provides potential nesting habitat for spotted owls (FT) and marbled murrelets (FT).	
22		Saddleback Mountain RNA	Existing		Exceptionally rare old-growth Pacific silver fir forest in Oregon Coast Range supports a diversity of rare invertebrate species that could include: Johnson's hairstreak (BSO), and spotted tail-dropper (BSO). Forest provides potential nesting habitat for spotted owls (FT) and marbled murrelets (FT).	Old-growth Pacific silver fir and western hemlock community. Saddlebag may be the last remaining mature naturally occurring Pacific silver fir stand in the Oregon Coast Range. Pacific silver fir was once thought to be more widespread but due to climatic changes may now be isolated to a few areas in the Oregon Coastal Mountains. Rare botanical species reported from Saddlebag Mountain RNA: Erythronium elegans (STO)	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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23	SALEM	Sandy River Gorge ONA	Existing	Cultural: Barlow Road and Rock Corral (currently listed) are National Register sites within the corridor. A prehistoric site eligible for the National Register also exists. Scenic: The inner gorge has steep canlyon walls, deep, trench-like pools, waterfalls and cliff-dwelling plant communities. The Mt Hood corridor (Highway 26) has a VRM 1 classification due to it scenic qualities and is congressionally designated as the Mt Hood Scenic Corridor.	Stocks of Lower Columbia River chinook, winter steelhead, and coho (all FT); cutthroat trout are present in this portion of the Sandy River. Spawning grounds for chinook salmon, rearing habitat for steelhead and chinook salmon are also present. Peregrine falcons (BSO), bald eagles (FT) and harlequin ducks (BAO) have been known to use the Sandy River Gorge. Migratory birds such as the willow flycatcher (Continental/ Regional species of Concern) have been documented within the ACEC.	Recognize that some of the lands are currently not in forest condition (agricultural). Value of the lands as a whole is greater than the value of individual parcels. Riparian old-growth forests in the Middle Sandy are rare in the watershed downstream from Marmot Dam. Bureau sensitive fungus species, Bridgeoporus noblissimus (BSO) is reported from the PACEC.	Precipitous slopes and canyon walls that line the inner gorge are a threat to outdoor enthusiasts enjoying the captivating views.
24		Sheridan Peak	Existing			Former special status botanical species, Poa marcida is reported from this location. This species no longer has special status.	
25		Silt Creek	Potential			Active, natural landslide with an old-growth forest and unique habitat related to the slow but continual mass earth movement. The area is also host to an abnormally large population of Pseudocyphellaria rainierensis.	Large scale, active natural landslide

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
26	SALEM	Snow Peak	Potential		Contains one occupied known northern spotted owl (FT) site and core area. Known to be used by various migratory bird species such as the olive-sided flycatcher (Continental/Regional Species of Concern). Band-tailed pigeon, and the nighthawk (BSO) are also known to use the area. Oregon slender salamander (BSO), Cascades torrent salamander (BAO) and the Evening fieldslug (BSO) (Derocerus Hesperium), have been documented within the PACEC.	Snow Peak's elevation of 4280 feet makes it an uncharacteristically high point very close to the Willamette Valley. The PACEC hosts a variety of special habitats including wet meadows, dry meadows, rock outcrops/crevice habitat, talus slopes, mature to old-growth forests, headwater streams with adjacent riparian and brushy thickets in close proximity to one another. This habitat complex provides for an abundant array of wildlife species and rare botanicals including Bridgeoporus noblissimus (BSO) ,Corydalis aquae-gelidae (BSO) , Pilophorus nigricaulis (BAO), Lobaria linita (BAO). A wetland botanical species (Fauria crista-galli) found nowhere else in Oregon is also found here.	
27		Soosap Meadows	Existing			These meadows are the only large, undisturbed expanse of natural Cascadian subalpine meadows in the Salem District. Streams which have cut through the glacial moraine have left behind a unique and diverse remnant of subalpine habitat.	
28		The Butte RNA	Existing			Willamette Valley & Coast Range Ecoregion Cells: Douglas-fir/poison oak forest, Oregon white oak/grass savanna. Uncommon transitional ecotone involving Willamette Valley margin plant communities and upland Coast Range forested communities. Rare botanical species reported from The Butte RNA include: Cimicifuga elata (BSO)	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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29	SALEM	Valley of the Giants ONA	Existing	Outstanding example of coastal old-growth forest	Valley of the Giants ONA lies within the largest contiguous patch of old-growth forest habitat in the northern Oregon Coast Range (over 800 acres, 400+ years old). This older forest provides nesting habitat for one of the largest concentrations of breeding marbled murrelets (FT) in Oregon. The proposed area also provides habitat for northern spotted owls (FT), bald eagles (FT), and Oregon Coastal steelhead (summer-run and winter-run; both FC). These old-growth stands provide an exceptionally large refugia for invertebrate species that are closely associated with older forest conditions.	Although not designated as a RNA, Valley of the Giants is well studied as a remnant 'old-growth' western hemlock plant association. Rare botanical species reported from this location include: Schistostega pennata (BAO), Filipendula occidentalis (BSO), and Tetraphis geniculata (BAO)	
30		Walker Flat	Existing			The only naturally occurrence of Sidalcea nelsonia (FT) in the Salem District is within the Walker Flat ACEC.	
31		Waterloo	Potential			The BLM's Waterloo parcel is within The Nature Conservancy's Waterloo Rocks portfolio site. This is the only known Salem District parcel with naturally-occurring Ponderosa Pine. The map of historic (mid-1800s) vegetation shows this as part of a large oak-fir-pine savanna, with prairie located just to the east. Considered in the context of the The Nature Conservancy's Ecoregional Assessment and the Waterloo Rocks portfolio site, in particular, the Waterloo parcel becomes an important part of a larger system of target conservation areas for the oak-pine-fir habitats.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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32	SALEM	Wells Island	Potential		Diverse floodplain forest, seasonally exposed gravel bars, and side-channel habitats. Supports nesting herons, ospreys and numerous songbird species. Invertebrates may include: Willamette floater mussel (BSO), and Oregon Floater.	Wells Island is an island in the Willamette River. Very little land from within the Willamette Valley is in Federal ownership. This island includes habitat that is unique from all BLM ownership in NW Oregon.	
33		White Rock Fen	Existing			The ACEC is centered around four fens differing in size. These four fens provide special habitat to an array of botanical species seldom seen in the Cascade Resource Area. Each fen is unique and may represent various stages in succession. Formation of the fens appears to be the result of an ancient large-scale mass wasting of the local ridge system which created a system of landslide scraps and sag ponds. Hydrologic features associated with bogs are the natural systems of interest. Bogs within this ACEC are unique to the region and are considered fragile.	
34		Wilhoit Springs	Existing			Contributes to low elevation old-growth cell as described by the Nature Conservancy . A rare community with regionally significance as an intact low elevation old-growth conifer forest.	
35		Williams Lake	Existing			Cascade lake and bog habitats with lakeside plant community that are unique and fragile. William's Lake and its bog ecosystem is the best example within the Salem District of a Cascadian massive seep formed lake undergoing peat bog/quaking bog succession.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
36	SALEM	Yampo	Existing			Yampo ACEC supports a late seral Willamette Valley bottom plant community which includes occurrences of rare botanical species Cimicifuga elata (BSO) and Lathyrus holochlorus (BSO). Lathyrus holochlorus has not been seen in this parcel since the 1980s.	
37		Yaquina Head ONA	Existing	Headland on the Pacific Ocean . The area is known as a cultural site for past native Americans use and as a historical site with an operating lighthouse.	A diverse assemblage of coastal habitats such as tide pools, rocky islands, and upland meadow provide for a great diversity of marine invertebrates, nesting seabirds, and marine mammals.	This headland on the eastern Pacific Ocean provides for several unique habitats including: Sitka spruce forest, lodgepole forest, headland grass/shrub communities, wildlife roosts and nesting habitat, tide pools and associated ocean organisms. Rare bryophyte species Eucladium verticillatum (BAO) is reported from the Yaquina Head ONA.	
38	EUGENE	Camas Swale RNA	Existing		Provides habitat for wildlife species, but does not explicitly list distinct species.	The site fills the natural heritage cell or element as: Douglas-fir/swordfern and Douglas-fir/Oregon-grape forest	
39		Coburg Hills RFI	Existing		Raptors (bald eagles (FT), northern spotted owl (FT), western screech owl, northern sawwhet owl, osprey red-tailed hawk; great gray owl, northern pygmy-owl, American kestrel)	Relict Forest Islands provide representative examples of mature and old-growth plant communities in areas where few to no other such communites exist.	
40		Cottage Grove Lake RFI	Existing		Raptors: (bald eagles (FT), northern spotted owl (FT), western screech owl, northern sawwhet owl, osprey red-tailed hawk; great gray owl, northern pygmy-owl, American kestrel, osprey)	Relict Forest Islands provide representative examples of mature and old-growth plant communities in areas where few to no other such communites exist.	
41		Cottage Grove Old Growth	Existing			Douglas-fir old-growth stand. Multiple canopy layers represent the late-successional stage of mesic Douglas-fir plant community with some existing older trees representing ages of 500 years old or more. Cimicifuga elata (BSO).	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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42	EUGENE	Cougar Mountain Yew Grove	Existing		Good cavity nester habitat	Site represents one of the lowest elevation stands of Pacific Yew remaining in the Willamette Valley	
43		Dorena Lake RFI	Existing		Raptors (bald eagles (FT), northern spotted owl (FT), western screech owl, northern sawwhet owl, osprey, red-tailed hawk; great gray owl, northern pygmy-owl, American kestrel, osprey).	Relict forest islands provide representative examples of mature and old-growth plant communities in areas where few to no other such communites exist.	
44		Dorena Prairie	Potential			Considered one of the few remaining representative examples of native upland prairie within the Willamette Valley Province.	
45		Esmond Lake	Potential		Coho salmon and steelhead migrate through Esmond Lake and spawn in tributaries above the lake. This lake appears to contain one of the best Coho rearing habitats in the Siuslaw Basin on BLM-administered lands.	Esmond lake has an uncommon geologic feature formed by a large deep-seated landslide. It is the one of only tow significantly sized lakes found in the Siuslaw Resource Area and has experienced very little human disturbance.	
46		Fox Hollow RNA	Existing			The site fills the natural area cell or element described in the oregon natural heritage plan as : Douglas-fir/swordfern and Douglas-fir/ Oregon-grape forest. A mixed stand of Douglas-fir and ponderosa pine is found on the south slopes and ridgtopes,with minor amounts of Oregon white oak and Incense-cedar.	
47		Grassy Mountain	Existing	Highly visible grassy bald.	Screening results recoginize contribution to wildlife habitat, but no species explicitly mentioned.	The site fills the natural heritage cell or element as: Blue wildrye or red fescue grass bald communities; vernal seepage slopes on low to mid elevation rocky bald communities, with monkey flower, saxigrages and moss. One of the finest, undisturbed representative examples of a grassy bald on the western margin of the Cascades.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
48	EUGENE	Heceta Sand Dunes ONA	Existing	Scenic dune system		Seashore bluegrass association; Red Fescue association; Shore pine/ slough sedge association; Shore pine/bearberry association; shore pine/hairy manzanita association. Bureau Assessment Species - Erioderma sorediatum; Leptogium brebissonii; Pannaria rubiginosa; Camplyopus schmidii	
49		Horse Rock Ridge RNA	Existing	Highly visible grassy bald.	Provides habitat for wildlife species, but does not explicitly list distinct species.	The site fills the natural area cell or element in the Oregon Natural Heritage Plan as: West Cascades Ecoregion/shrub and Grassland type blue wildrye or Roemer's fescue grass bald communities.	
50		Hult Marsh	Existing	scenic values		Bureau Assessment Species - Utricularia gibba and Lycopodiella inundata	
51		Lake Creek Falls	Existing				The algae that creates a slippery rock slide, also creates a very unstable walking surface in the stream. Sharp, poorly visible, underwater boulders in pools present hazards to divers. Unstable logs tend to jam up in the pools following winter floods and present hazards to swimmers.
52		Lorane Ponderosa Pine	Potential			Willamette Valley Ponderosa Pine; The Willamette Valley population of ponderosa pine is considered a separate and distinct population from other ponderosa pine populations within Oregon.	
53		Low Elevation Headwaters of the McKenzie River	Potential	McKenzie River (11 miles) suitable for inclusion in National Wild and Scenic System as a Recreational Segment	Bull trout; Upper Willamette spring chinook; cutthroat trout; northern spotted owl, tailed frog; Harlequin duck	Unique nature of a large contnuous block of native forest. Minimally disturbed blocks of land under 2,000 feet on the east side of Willamette Valley.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
54	EUGENE	McGowan Meadow	Potential	Proposed Celebrating Wildflower Site		Site exemplifies a wet meadow with flora of both the Cascades and Willamette Valley ecoregions. Bureau Sensitive - Sidalcea campestris	
55		Mohawk RNA	Existing		Provides habitat for wildlife species, but does not explicitly list distinct species (Spotted Owls?).	The site fills the natural heritage cell or element as: Douglas-fir/western hemlock/Oregon-grape and salal forest. Old-growth Douglas-fir and western hemlock within low elevation Willamette Valley foothills. Site contains small marsh. Tributaries of McGowan Creek flow throuogh or originate in the area.	
56		Oak Basin Prairies	Potential		Fender's Blue Butterfly (Icaricia icariodes fenderi), Taylors Checkerspot butterfly (Rare).	Threse tracts are portions of a large upland prairie complex on the west side of the Coburg hills. Kincaids Lupine (Lupinus sulphureous ssp. kincaidii) (FT), Hitchcock's blue-eyed grass (BSO).	
57		Taylor Creek	Potential		Bald eagle (FT), northern spotted owl (FT), osprey. Western parcel is a significant spawning channel of the McKenzie River.		
58		Upper Elk Meadows RNA	Existing			Four distinct plant communities are in the area: open, wet sedge meadow; wet red alder/willow/hawthorn thickets; open forest dominated by old-growth silver and grand fir; and closed forest dominated by old-growth Douglas-fir.	
59		Willamette Valley Prairie/ Oak and Pine Area	Potential			These sites represent some of the few remaining upland red fescue prairies and oak habitats in the Willamette Valley Province.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
60	ROSEBURG	Bear Gulch RNA	Existing			Douglas-fir/canyon live oak woodland w/ poison oak and dwarf Oregon-grape; and Douglas-fir/canyon live oak forest	
61		Beatty Creek RNA	Existing			Jeffrey pine community on serpentine. Eucephalus vialis, Polystichum californicum, Pseudoleskeella serpentinensis	
62		Bushnell-Irwin Rocks RNA	Existing			Oregon white oak savanna; Oregon white oak/Douglas-fir/poison oak woodland; Romanzoffia thompsonii, Polystichum californicum	
63		Callahan Meadows	Potential			Kincaid's lupine (Lupinus sulphureous ssp. kincaidii) (FT), serpentine meadow, Calochortus umpquaensis	
64		China Ditch	Potential			Kincaid's lupine (Lupinus sulphureous ssp. kincaidii) (FT), serpentine meadow, Calochortus umpquaensis	
65		Myrtle Island RNA	Existing			Old-growth stand of California bay laurel and Douglas-fir (riparian hardwood forest along a major river)	
66		North Bank	Existing	important cultural site	Columbian white-tailed deer	Arabis koehleri var. k., Perideridia erythrorhiza, Plagiobothrys hirtus, Sulcaria badia	
67		North Myrtle Creek RNA	Existing			Douglas-fir/ponderosa pine forest; white fir/dwarf Oregon-grape; Douglas-fir/bigleaf maple forest	
68		North Umpqua River	Existing	scenic	Fish		
69		Red Pond RNA	Existing		Northern spotted owl, western pond turtle	low elevation permanent pond; Wolffia borealis, Phaeocollybia californica	
70		Stouts Creek	Potential			Kincaid's lupine (Lupinus sulphureous ssp. kincaidii) (FT), serpentine meadow, Calochortus umpquaensis	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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71	ROSEBURG	Tater Hill RNA	Existing			western hemlock/oceanspray community	active landslide
72		Umpqua River Wildlife Area	Existing		Bald eagle (FT)		
73	COOS BAY	Brownson Ridge	Potential		Marbled murrelet occupied site (FT), northern spotted owl (FT) known site.	Well developed Port-Orford-cedar stand with all age classes	
74		Cherry Creek RNA	Existing		Northern spotted owl (FT), marbled murrelet (FT).	Fills two (Western hemlock/oxalis; Western hemlock/rhododendron-Oregon-grape) ONHP Coast Range Ecological Cells	
75		China Wall	Existing	Remnant of historic Brewster Trail; prehistoric site.		unique plants associated with bald meadows;	
76		Euphoria Ridge	Potential			Old-growth western redcedar stand series rare in Coast Range at this elevation (potential ONHP Coast Range cell)	
77		Hunter Creek Bog	Existing			Fills ONHP Coast Range Ecoregion Cell -- Port Orford Cedar on ultramafic soils. Botany - large, diverse serpentine bog.	
78		New River	Existing	Prehistoric sites	Western snowy plover (FT), Northwestern pond turtle (BSO). Coho, Chinook, Cutthroat Trout (FC), Steelhead (FC).	Fills two ONHP Coastal lowlands ecological cells (lacustrine and palustrine); nine special status plants -- Abronia umbellata ssp. breviflora pink sand verbena (BSO), Calypogeia sphangnicola Liverwort (BAO), Cicendia quadrangularis timwort (BAO), Eriophorum chamissonis russet cotton-grass (BAO), Lilium occidentale western lily (FE), Phacelia argentea silvery phacelia (BSO), Scirpus subterminalis water clubrush (BAO))	
79		North Fork Chetco	Existing	Undisturbed cultural site	Anadromous fish habitat -- searun cutthroat trout.	Oregon myrtle/evergreen shrub riparian forest ONHP Coast Range cell.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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82	COOS BAY	North Spit	Existing	Scenic coastal landscapes comprised of dunes, deflation plain wetlands and Sitka Spruce forest islands. Historic US Lifeguard Service sites and artifacts, and potential prehistoric site.	Western snowy plover (FT), marbled murrelet (FT), northwestern pond turtle (BSO), purple martin (BSO).	Numerous outstanding plant associations and wetlands. Special status plants: Bryoria pseudocapillaris lichen (BSO), Byoria spiralifera lichen (BSO), Cordylanthes maritimus ssp. Palustris Point Reyes bird's-beak (BSO), Heterodermia leucomelos lichen (BAO), Niebla cephalota lichen (BAO).	
83		Rocky Peak	Potential	Historic trail and lookout sites. Panoramic views of coastline plains, foothills and ocean.	Habitat for marbled murrelet (FT), northern spotted owl (FT), fringed myotis (BAO), foothill yellow-legged frog (BAO), spotted tail-dropper (BSO), and northern goshawk (BSO).	ONHP Special species Monardella purpurea Siskiyou monardella (BA); rare meadow, knob-cone pine plant communities.	
84		Roman Nose	Potential	Outstanding, sweeping views of forest landscape from highest point in local region.		Outstanding example of Oregon Coast Range grassy bald system.	
85		Steel Creek	Potential	Portion of historic Brewster Trail.	One of the most productive spawning reaches in Coquille Basin; supports searun and resident cutthroat trout, chinook, coho,, steelhead and Pacific lamprey.	Large, structurally complex unmanaged and undisturbed late-successional forest communityuncommon in Coast Range.	
86		Tioga Creek	Existing		High quality stream/riparian conditions and spawning habitat for coho, steelhead, and cutthroat trout.	Old-growth riparian Douglas-fir/ hardwood community on 4th order stream with high value as reference site.	
87		Upper Rock Creek	Existing			Large redcedar dominated forest with sedge dominated wetlands; Fills Western redcedar-western hemlock/ skunk cabbage ONHP Coast Range Ecological cell.	
88		Wassen Creek	Existing	Scenic -- Large block of undisturbed mid-age forest dissected by creek with several waterfalls, plunge pools, and small palustrine lake.	Pure strain of native cutthroat trout; northern spotted owl (FT);	Fills ONHP Coast Range Ecoregion Palustrine Wetlands pond at mid to high elevation); fits two ONHP Western Hemlock association cells.	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
					Fish and wildlife	Natural process or system	Natural hazard
89	MEDFORD	Baker Cypress	Existing			Most northern Cupressus bakeri stand in north America	
90		Bobby Creek RNA	Existing		Northern spotted owl (LT), northern goshawk (BSO), pileated woodpecker (BSO), tailed frog (BA), western bluebird	Intact, uninfected Chamaecyparis lawsoniana stands, Natural heritage cell, Lithocarpus densiflorus - Douglas-fir communities, late-successional reference stands, hydrological reference watershed.	
91		Brewer Spruce RNA	Existing		Northern spotted owl (FT), northern goshawk (BSO)	Unique conifer assemblage, Picea breweri, Chamaecyparis lawsoniana and Chamaecyparis nootkatensis community (rare inland), Natural heritage cell, serpentine pockets, the most resistant, uninfected stands of Chamaecyparis lawsoniana, critical seed/tree improvement collection area, late sucessional reference area, small natural lake	
92		Cobleigh Road	Potential			Limnanthes floccosa ssp. bellingeriana (BSO), Fritillaria gentneri (FE) bulb collection site	
93		Crooks Creek	Existing		Plecotus townsendii (Townsends big eared bat) (BSO), Siskiyou salamander (BAO)	Fritillaria glauca (BAO), Limestone caves, ponds, later successional Lithocarpus densiflorus - Douglas-fir communities	
94		Dakubetede Wildland	Potential	Sterling Mine Ditch	Northern spotted owl (FT), Siskiyou salamander (BSO)	Camissonia graciliflora (BAO), Cimicifuga elata (BSO), Cirsium ciliolatum (BSO), Crumia latifolia (BAO), Cypripedium fasciculatum (BSO), Fritillaria gentneri (FE), Sedum oblanceolatum (BSO), Tripterocladium leucoladulum (BAO) western most stands of Juniperus occidentalis, rare Betula occindentalis var. onapina, intact native grasslands	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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95	MEDFORD	East Fork Whiskey Creek	Potential		Northern spotted owl (FT), northern goshawk (BSO), peregrine falcon (BSO), clouded salamander, Pacific fisher (C), fringed myotis (bat), tailed frog (BAO). Intact functioning riparian habitat with cutthroat trout and sculpins.	Sedum moranii (BSO), late-successional reference stands of Lithocarpus densiflorus - Douglas-fir communities, inclusions of knobcone pine, Natural Heritage cell	
96		Eight Dollar Mountain	Existing	Historic mining, mining claims		Calochortus howellii (STO), Epilobium oreganum (BS), Gentiana setigera (BS), Micoseris howellii (ST), Monardella purpurea (BA), Perideridia erythrorhiza (BS), Pseudoleskeella serpentinensis (BA), Senecio hesperius (BS), Viola primulifolia ssp. occidentalis (BS). Serpentine communities and Darlingtonia fens	
97		French Flat	Existing	Historic mining		Erythronium howellii (BSO), Limnanthes gracilis ssp. gracilis (BSO), Lomatium cookii (FE), Microseris howellii (STO), Senecio hesperius (BSO), serpentine plant communities (Jeffery pine-Arcotostaphylos visida-Festuca roemerii-Stipa lemonii), vernal meadows with Deschapsia caespitosa-Danthonia californica.	
98		Grayback Glades RNA	Existing			Natural heritage cells, aquatic (1st to 3rd order cell), Port-Orford-cedar and white fir systems, uninfected with Port-Orford-cedar disease, Sitka alder and vine maple glades, Shasta red fir	
99		Hole-In-The-Rock	Existing			Unique geological feature, a natural basalt arch, creating a 'hole' in the rock.	
100		Holton Creek RNA	Existing			Natural Heritage cell, reference site for low elevation late-successional Douglas-fir/white fir community	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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101	MEDFORD	Hoxie Creek	Existing	High scenic value, high recreation use	Bald eagle (FT), osprey	Relict remnant late-successional Douglas-fir community, with few ponderosa pine.	
102		Iron Creek	Existing			Douglas-fir, Pacific madrone and California black oak communities	
103		Jenny Creek	Existing		Jenny Creek sucker (BSO), Red band trout (BSO)	Calochortus greenii (BSO), Nemacladus capillaris (BAO)	
104		King Mountain Rock Garden	Existing	Scenic location, view point, high recreation use.		Frillaria glauca (BSO), Phacelia verna (G3/S3), high elevation serpentine outcrop community	
105		Long Gulch	Potential		Northern spotted owl (FT)	Crumia latifolia (BAO), unique trellised watershed, late-successional Douglas-fir/Arctostaphylos visicida chaparral	
106		Lost Lake RNA	Existing		Northern spotted owl (FT)	Cimicifuga elata (BSO), Natural heritage cell, Aquatic (natural lake), mixed conifer low elevation communities	
107		Moon Prairie	Existing	Scenic and special education value for relict old-growth	Northern spotted owl (FT)	Last remaining old-growth stand on Moon prairie, old-growth, multi-layered stand of Douglas-fir and white fir with Pacific yew, ponderosa pine and sugar pine.	
108		North Fork Silver Creek RNA	Existing			Leucothoe davisiae (BAO), Tripterocladium leucocladulum (BAO), Natural heritage cells, white fir, Douglas-fir/Port-Orford-cedar, and sugar pine/Quercus saddleriana communities, serpentine outcrops and Darlingtonia fens, burned area reference site (1987 & 2002)	
109		Oregon Gulch RNA	Existing		Northern goshawk (BSO)	Calochortus greenei (BSO), Microseris laciniata ssp. detlingii (BSO), Fritillaria gentneri (FE), Natural heritage cell, Mixed conifer forest and mixed chaparral (Arctostaphylos viscida-Ceanothus-Rosaceous species), grasslands.	
110		Pickett Creek	Potential			Fritillaria gentneri (FE)	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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111	MEDFORD	Pilot Rock	Existing	Geologic feature, scenic, high recreation use	Peregrine falcon (LE)	Calochortus greenei (BSO), Fritillaria gentneri (FE)	
112		Pipe Fork RNA	Existing		Northern spotted owl (FT), Siskiyou salamander (BSO)	Cypripedium fasciculatum (BSO)	
113		Poverty Flat	Existing			Limnanthes floccosa ssp. bellingeriana (BSO), vernal pool systems	
114		Reeves Creek	Potential			Limnanthes gracilis ssp. gracilis (BSO), Lomatium cookii (FE)	
115		Rough and Ready	Existing	Scenic, Adjacent State Botanical Wayside, Recreation Use.		Hastingsia bracteosa var. bracteosa (BSO), Delphinium nudicale (BAO), Calochortus howellii (STO), Erthronium howellii (BSO), Limnanthes gracilis ssp. gracilis (BSO), Lomatium cookii (FE), Microseris howellii (BSO), Unique flood plane and Hyporheic zone	
116		Round Top Butte RNA	Existing			Natural heritage cell, oak woodland savannah, Danthonia californica, Festuca roemerii, Stipa lemmonii, Agropyron spicatum grasslands, vernal pool, unique Calaochortus uniflorus population (un-common but not listed).	
117		Scotch Creek RNA	Existing			Astragalus californicus (BAO), Carex serratodens (BAO), Fritillaria gentneri (FE), Microseris laciniata ssp. detlingii (BSO), Solanum parishii (BSO), Natural heritage cell: rosaceous chaparral	
118		Sterling Mine Ditch	Existing	Historic mining ditch, National Register of Historic Places.		Fritillaria gentneri (FE) (also in proposed Dakubetede ACEC)	
119		Table Rocks ONA	Existing		Vernal pool fairy shrimp (LT)	Limnanthes floccosa ssp. pumila (STO), Microseris laciniata ssp. detlingii (BSO), Plagiobothrys austiniae (BAO), Plagiobothrys greenei (BAO), Ranunculus austrooreganus (BSO), Tripterocladium leucocladulum (BAO), vernal pools	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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120	MEDFORD	Tin Cup	Existing			Relict late-successional white fir community	
121		Waldo-Takilma	Potential	Historic Mining, National Register of Historic places		Calochortus howellii (STO), Crumia latifolia (BAO), Cypripedium fasciculatum (BS), Erythronium howellii (BSO), Fritillaria glauca (BAO), Limnanthes gracilis ssp. gracilis (BSO), Lomatium cookii (FE), Microseris howellii (STO), Pseudoleskeella serpentinensis (BAO), Senecio hesperius (BSO), Eucephalus vialis (BSO), Streptanthus howellii (BSO).	
122		Woodcock Bog RNA	Existing			Lomatium cookii (FE), Carex livida (BAO), Epilobium oreganum (BSO) , Gentiana setigera (BSO), Hastingsia bracateosa var. bracteosa (STO), Mircroseris howellii (STO), Monardella purpurea (BAO), Senecio hesperius (BSO), Viola primulifolia ssp. occidentalis (BSO), Jeffrey pine/ serpentine communities, Darlingtonia fens	
123	KLAMATH	Bumpheads	Potential	Numerous, undisturbed prehistoric sites		Western juniper/Idaho fescue (Juniperus occidentalis/Festuca idahoensis) plant community that has been naturally somewhat isolated from grazing	
124		Four Mile Wetland	Potential	Adjacent to National Scenic Byway	Endangered shortnose and Lost River suckers, bald eagle (FT) foraging and nesting, spotted frogs (FC), yellow rails (BSO), bull trout (FT) habitat, greater sandhill crane (S)	Complex of wetland plant communities	
125		Miller Creeek	Existing	Deep canyon within high desert plateau	Riparian habitat for migratory songbirds and raptors	Old-growth ponderosa pine community, perennial stream within high desert environment	

MAP #	District	ACEC Name	Status	Historic, cultural, scenic	Relevant and Important Value Category		
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126	KLAMATH	Old Baldy RNA	Existing			Natural Heritage cells: high elevation white fir communities with Shasta red fir, mountain hemlock, Pacific silver fir, and Western white pine; Southern Oregon Cascades chapparel.	
127		Tunnel Creek	Potential		Oregon spotted frog (Rana pretiosa), a federal candidate species.	Lodgepole pine swamp with bog blueberry (Vaccinium uliginosum) and sedges. Riparian and wetland processes. English sundew (Drosera anglica), an insectivorous plant, is listed as endangered by the state of Maine and as threatened by the state of Wisconsin.	
128		Upper Klamath River	Existing	Historic road, prehistoric cultural artifacts/sites. The Klamath River Canyon holds great spiritual and religious significance for the Klamath Tribe and the Shasta Nation. The unique landform, diverse vegetation, water, and a low level of adverse cultural modifications has been given a Scenic Quality A classification.	Lost River and shortnose suckers (E), Klamath largescale sucker (BSO), native inland redband trout, bald eagle (FT) nests, Townsend's big-eared bat (BSO).	Unique plant communities bisecting the Cascade Mountains which range from montane conifer forest communities to high desert communities, and from riparian communities to oak savannah communities. Red-root yampah (Perideridia erythrorhiza a BSO plant species).	
129		Upper Klamath River Addition	Potential	Historic road, prehistoric cultural artifacts/site. The Klamath River Canyon holds great spiritual and religious significance for the Klamath Tribe and the Shasta Nation. The unique landform, diverse vegetation, water, and a low level of adverse cultural modifications has been given a Scenic Quality A classification.	Lost River and shortnose suckers (FE), Klamath largescale sucker (BSO), native inland redband trout, bald eagle (FT) nests.	Unique plant communities bisecting the Cascade Mountains which range from montane conifer forest communities to high desert communities, and from riparian communities to oak savannah communities. Red-root yampah (Perideridia erythrorhiza a BSO plant species).	
130		Wood River Wetland	Existing	Native American village and wocus gathering sites.	Lost River suckers (FE), bald eagle (FT) foraging and nesting, spotted frogs (FC), yellow rails (BSO), wild trout, migratory waterfowl	Complex of wetland plant communities	

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131	KLAMATH	Yainax Butte	Existing	Yainax Butte is considered to be a very important place in the traditional beliefs of the Klamath Tribes, and is probably eligible for inclusion to the National Register of Historic Properties as a Traditional Cultural Property.		Unusual variation of bitterbrush/ bluebunch wheatgrass plant community; blue-leaved penstemon (Penstemon glaucinus), a BSO plant species	

Appendix N. Cultural Resources

This appendix provides the background on federally recognized Tribes in the Planning Area.

In this appendix:

Federally Recognized Native American Tribes in or with Interests in the Planning Area 1353

Federally Recognized Native American Tribes in or with Interests in the Planning Area

Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians

The Confederated Tribes of the Grand Ronde

Confederated Tribes of Siletz

The Confederated Tribes of Warm Springs

Coquille Indian Tribe

Cow Creek Band of Umpqua Tribe of Indians

The Klamath Tribes

Modoc Tribe of Oklahoma

Quartz Valley Indian Community

Indian tribes represent unique legal entities in the United States and are distinct political communities with extensive powers of self-government. Tribal sovereignty predates the U.S. government. Treaties, Federal statutes and executive agreements over the past 200 years have established a special trust relationship between tribes and the Federal government. The Federal Bureau of Indian Affairs has been designated by the Secretary of the Interior as the primary agency to protect tribal interests and administer trust responsibilities.

During the 1950s, in a move to assimilate Native Americans into mainstream America, the U.S. government ended Federal trusteeship of roughly three percent of the country's Native American population through a process called termination. Of the 109 tribes and bands terminated, 62 were native to Oregon. Even though the tone of the termination legislation was emancipation, the net effect of the policy on terminated tribes was cultural, political and economic devastation.

In recent years, however, vigorous efforts have been mounted by terminated tribes to reestablish or restore the trust relationship. In 1977, the Confederated Tribes of Siletz won restoration; followed by the Cow Creek Band of Umpqua Indians in 1982; the Confederated Tribes of the Grand Ronde in 1983; the Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians in 1984; the Klamath Tribes in 1986 and the Coquille Tribe of Oregon in 1989.

Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians of Oregon

These tribes are the descendents of the aboriginal inhabitants of the central and south-central coast of Oregon. Their homeland includes the estuaries of Coos Bay, and the Umpqua and Siuslaw Rivers. The Tribes have been operating under a confederated government since the signing of the Treaty of August, 1855. They currently possess a 6.1 acre reservation and a tribal hall erected in 1940, but past claims have not yet been settled. The Tribes hope to work out a reservation agreement with the Federal government. The Tribes had a relationship with the US government from 1853 until their termination by Congress in the year of 1956. The majority of their members were removed in 1856 from their aboriginal homelands and held on a wind swept spit at the mouth of the Umpqua River at a place called Fort Umpqua. Their territory encompassed part of Coos, Curry, Douglas, Lane and Lincoln counties. Federal recognition was restored to the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians in October of 1984.

Confederated Tribes of the Grand Ronde Community of Oregon

These tribes include over 20 Tribes and bands from western Oregon and northern California that were relocated to the Grand Ronde Reservations in the 1850s. These included the Rogue River, Umpqua, Chasta, Kalapuya, Molalla, Salmon River, Tillamook, and Nestucca Indians. The Grand Ronde Reservation was established by treaty arrangements in 1854 and 1855 and an Executive Order of June 30, 1857. The Reservation contained over 60,000 acres and was located on the eastern side of the coastal range on the head-waters of the South Yamhill River. In 1887, under the General Allotment Act, 270 allotments totaling slightly over 33,000 acres of the Grand Ronde Reservation were made to individual Indians. The result of this action was the loss of major portions of the reservation to non-Indian ownership. Then, in 1901, U.S. Inspector James McLaughlin declared a 25,791 tract of the reservation "surplus" and the land was sold. In 1954, Congress passed the Termination Act which severed the trust relationship between the Federal government and the Tribe. On November 22, 1983, with the signing of Public Law 98-165, the Grand Ronde Restoration Act, the Tribe was restored to Federal recognition. In addition, on September 9, 1988, the Tribe regained 9,811 acres of the original reservation when President Ronald Reagan signed the Grand Ronde Reservation Act into law. The reservation lies just north of the community of Grand Ronde. The mission of the Grand Ronde Natural Resources Division is to manage, develop, and protect the natural resources of the Grand Ronde Tribes, such as timber, non-merchantable young stands of trees, fish, wildlife, recreation, minerals, air, streams, roads, minor forest products. The NRD strives to manage the Tribes' resources in a unique, creative, and efficient manner, taking care to meet mandates while balancing the importance of non-revenue-producing elements of the reservation.

Confederated Tribes of the Siletz Reservation, Oregon

These tribes are a federally recognized confederation of 27 bands originating from northern California, western Oregon and southern Washington. Termination was imposed on the Siletz by the United States government in 1955. In November of 1977, the Tribe was restored to Federal recognition. The Tribe occupies and manages a 3,666 acre reservation located in Lincoln County, Oregon. The Tribe manages resources on their reservation including wildlife, timber, water, fish and air quality.

Confederated Tribes of the Warm Springs Reservation of Oregon

These tribes include bands of the Wasco, Warm Springs and Paiute. The Wasco bands on the Columbia River were the eastern-most group of Chinookan-speaking Indians living along the Columbia River. The Warm Springs bands who lived along the Columbia's tributaries. The Paiutes lived in southeastern Oregon. In 1855, Joel Palmer, superintendent for the Oregon Territory, negotiated a series of Indian treaties including the one establishing the Warm Springs Reservation. Under the Treaty of 1855, the Warm Springs and Wasco Tribes relinquished approximately ten million acres of land, but reserved the Warm Springs Reservation for their exclusive use. The Tribes also kept their rights to harvest fish, game and other foods off the reservation in their usual and accustomed places. The Tribes' Natural Resource Management Services exist to plan and execute a balanced direction for the protection, use, and enhancement of all tribal natural resources. Resources shall be managed as sustainable assets available for cultural, subsistence, economic and social purposes or opportunities in perpetuity consistent with the Confederated Tribes sovereign and treaty status.

Coquille Tribe of Oregon

This tribe's members are descended from people who inhabited the watersheds of the Coquille River system, a small portion of Coos Bay at the South Slough, and areas north and south of the Coquille River mouth where it enters the ocean at present day Bandon. Coquille ancestral territory encompassed more than 700,000 acres, ceded to the U.S. Government. Coquille headmen signed the treaties in 1851 and 1855. Because neither treaty was ever ratified by Congress, those Coquille people and their descendants were denied a permanent homeland. The Coquille Indian Tribe was terminated by the U.S. Government in 1954. On June 28, 1989, the Coquilles regained their status as a federally recognized Indian tribe. The modern Coquille Tribe negotiated several land purchases, which constitute a 6,400 acre tribal land base. By an Act of Congress in 1996, the Coquille Tribe now has reservation acreage totaling 6,512 acres.

Cow Creek Band of Umpqua Indians of Oregon

Their traditional use area lies primarily in Douglas County, from the Umpqua River headwaters to the Pacific Ocean. The Tribe's ceded lands lie in the Cow Creek drainage of the South Umpqua River. In 1853 seeking a peaceful solution to tensions that had intensified after gold was discovered in their territory, the Cow Creek Umpqua Indians entered into a treaty with the Federal government that resulted in their ceding their homeland in exchange for $12,000. The treaty left the Cow Creek Umpquas without land, a place to live, or protection. The Cow Creeks had been drawn into the Rogue Indian wars in the early 1850s and as a result of the fighting and their new treaty in 1856 survivors were rounded up and forcefully marched 150 miles north to the Grand Ronde Reservation. In 1954 the government declared that there were no Indians left in western Oregon, the existing Cow Creeks notwithstanding, and the Tribe was terminated. In 1982 the Tribe was restored and entered into formal relations with the United States government through the Bureau of Indian Affairs. Public Law 100-139 (1987), the Cow Creek Umpqua "Distribution Judgment Funds Act", adopted the tribal endowment plan. The Bureau of Indian Affairs allowed the Tribe to use the settlement funds as collateral for the purchase of what was known as the "Evergreen" land. In addition, the Tribe was allowed to draw the interest on their endowment for the purpose of economic development, education, housing, and elderly assistance.

Klamath Indian Tribe of Oregon

This tribe includes the Klamaths, the Modocs and the Yahooskin. The Tribes' traditional territory is in the Klamath Basin of Oregon. The Klamath Tribes ceded more than 23 million acres of land in 1864 and entered the reservation. In 1954, the Klamath Tribes were terminated from Federal recognition as a tribe by act of Congress. In 1974 the Federal Court ruled that the Klamath Tribes had retained their Treaty Rights to hunt, fish and gather, and to be consulted in land management decisions when those decisions affected their Treaty Rights. In 1986, the Tribe was successful in regaining restoration of Federal recognition.

Modoc Tribe of Oklahoma

This tribe originally lived on Little Klamath Lake, Modoc Lake, Tule Lake, Clear Lake, Goose Lake, and in the Lost River Valley. In 1864, the Modoc ceded lands and moved to the Klamath Reservation. Due to starvation conditions and tensions with the Klamath Indians, some Modocs returned to their original territory in northern California in 1870. In 1872, attempts to force their return to Oregon began the Modoc War and the Modocs retreated to lava beds for months. Finally overrun, 153 survivors were sent to Quapaw Agency in Oklahoma. Other survivors were sent to the Klamath Reservation. In 1909, some Modocs were permitted to return to Klamath Agency. In 1954, the Oklahoma and Oregon Modoc Tribes were terminated. In 1978, the Oklahoma Modoc Tribes were reinstated.

Quartz Valley Indian Community of the Quartz Valley Reservation of California

Located in Siskiyou County, California, they include the members Shasta Tribe that traditionally lived in southern Oregon and northern California. A treaty signed by Shasta Tribal chiefs on Nov. 4, 1851 was never ratified by the Congress and the Tribe did not get their own reservation. Some members of the Shasta Tribe joined the Confederated Tribes of the Grand Ronde Community of Oregon. Other members were included in California reservations.



Appendix O. Lands

This appendix provides detailed data about lands, realty, and access information found in Chapters 2 and 3 of the Draft EIS.

In this appendix:

Land Tenure Adjustment Criteria 1361

Land Withdrawals and Land Tenure Zone 3 Lands 1363

Inventory of Communication Sites 1426

Analytical Methods to Determine Legal Public Accessibility of BLM Lands in the Planning Area 1430

Land Tenure Adjustment Criteria

In accordance with FLPMA and other laws, Executive Orders, and Departmental and Bureau policy, the following factors will be considered in evaluating opportunities for disposal or acquisition of lands or interests in lands. This list is not considered all inclusive but represents the major factors to be considered.

General Land Tenure Adjustment Evaluation Factors

- Improves the manageability of specific areas.
- Maintains or enhances important public values and uses.
- Consolidates Federal mineral estate and/or reuniting split surface and mineral estates.
- Facilitates development of energy and mineral potential.
- Reduces difficulty or cost of public land administration.
- Provides accessibility to the land for public recreation and other uses.
- Amount of public investments in facilities or improvements and the potential for recovering those investments.
- Suitability of the land for management by another Federal agency.
- Significance of the decision in stabilizing or enhancing business, social and economic conditions, and/or lifestyles.
- Meets long-term public management goals as opposed to short-term.
- Facilitates National, State, and local BLM priorities or mission statement needs.
- Consistency with cooperative agreements and plans or policies of other agencies.
- Facilitates implementation of other aspects of the approved Resource Management Plans.

Acquisition Criteria

- Facilitates access to public land and resources retained for long-term public use.
- Secures Threatened or Endangered or Sensitive plant and animal species habitat.
- Protects riparian areas and wetlands.
- Contributes to biodiversity.
- Protects high-quality scenery.
- Enhances the opportunity for new or emerging public land uses or values.
- Facilitates management practices, uses, scales of operation, or degrees of management intensity that are viable under economic program efficiency standards.
- Secures lands adjacent to rivers eligible for designation under the National Wild and Scenic Rivers Act
- Protects significant cultural resources and sites eligible for inclusion on the National Register of Historic Places
- Whether private sites exist for the proposed use.

Disposal Criteria

The following criteria will be used to identify parcels in Land Tenure Zones 2 or 3.

- Suitability for purposes including but not limited to community expansion or economic development, such as industrial, residential, or agricultural development.
- Lands of limited public value.
- Lands that are difficult for the BLM to manage and unsuitable for transfer to other federal agencies or State and local governments.
- Lands that would aid in aggregating or repositioning other public lands or public land resource values in retention areas to facilitate National, State, and local objectives where the public values to be acquired outweigh the values to be exchanged.

O&C Land Exchange Criteria

Forest management and related factors to consider when evaluating the feasibility of an O&C land exchange include the following:

- Land exchanges which maintain the existing balance between the various land use allocations will be considered favorably.
- Offered lands which are primarily suitable for agriculture, business, or home sites, or which would require extensive post-acquisition management will not be favorably considered. O&C lands designated for timber production will generally not be exchanged for lands which will be managed solely for a single use, such as species protection.
- Generally, where cutting rights are reserved on existing and future timber stands by the proponent, the proposed exchange will not be considered favorably.
- Proposals which result in a material reduction in the number of acres of O&C or CBWR land or acres of harvestable timber should not be considered favorably. See I.M. No. OR-99-081, dated August 4, 1999, for an interpretation of Section 3 of Public Law 105-321 which established a requirement of "No Net Loss" of O&C and CBWR lands in western Oregon.
- The exchange of O&C and CBWR lands specifically for lands located outside of the 18 O&C counties is prohibited by regulations in 43 CFR 2200.0-6(e). This restriction applies to timber and other interests in lands as well.

Land Withdrawals and Land Tenure Zone 3 Lands

The following tables contain detailed information about existing and proposed land withdrawals. Zone 3 lands are available for disposal.

Table 286. Existing land withdrawals and recommendations for continuance.

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
Salem	OR 23947	Act of Congress 3/5/80	T. 10 S., R. 11W., SEC. 30	100	Yaquina Head	BLM, USCG	A	C
	OR 8920	PLO 5372	T. 8 S., R. 6 W., SEC 33	80	Little Sink	BLM	B	C
	OR 37275	Act of Congress 6/26/84	T. 7 S., R. 3 & 4 E.	5800	TABLE ROCK WILDERNESS	BLM	A	C
	OR 05555	ANS-58-1	T. 15 S., R. 7 W., SEC. 7	40	AIR NAVIGATION/ PRAIRIE MTN	FAA	B	C
	OR 3060	PLO 989	T. 3 S., R. 5 E., SEC 27 & 28	600	FISH HACTCHERY & EAGLE CREEK	USFWS	B	C
	OR 15487	PLO 3609	T. 4 S., R. 3 E., SEC. 13	320	SEED ORCHARD/ WALTER HORNING	BLM	B	C
	OR 16183	PLO 3869	T. 3 S., R. 7 W., SEC 32	35	REC SITE/ ALDER GLENN	BLM	B	C
	OR 16183	PLO 3869	T. 14 S., R. 7 W., SEC 25 & 26	40	REC SITE/ ALSEA FALLS	BLM	B	C
	OR 16183	PLO 3869	T. 9 S., R. 3 E., SEC 7	80	REC SITE/ CANYON CREEK	BLM	B	C
	OR 16183	PLO 3869	T. 12 S., R. 3 E., SEC 3	80	REC SITE/ DOGWOOD	BLM	B	C
	OR 16183	PLO 3869	T. 9 S., R. 3 E., SEC 9	120	REC SITE/ ELKHORN VALLEY	BLM	B	C
	OR 16183	PLO 3869	T. 9 S., R. 2 E., SEC 25	160	REC SITE/ FISHERMEN'S BEND	BLM	B	C
	OR 16183	PLO 3869	T. 3 N., R. 3 W., SEC 21	20	REC SITE/ LITTLE BEND	BLM	B	R
	OR 16183	PLO 3869	T. 7 S., R. 6 W., SEC 4 & 9		REC SITE/ MILL CREEK	BLM	B	C
	OR 16183	PLO 3869	T. 14 S., R. 9 W., SEC 13	40	REC SITE/ MISSOURI BEND	BLM	B	C
	OR 16183	PLO 3869	T. 3 S., R. 4 E., SEC 11	160	REC SITE/ NORTH FORK EAGLE CREEK	BLM	B	C
	OR 16183	PLO 3869	T. 4 N., R. 3 W., SEC 7	30	REC SITE/ SCAPONIA	BLM	B	C
	OR 16183	PLO 3869	T. 11 S., R. 4 E., SEC 19	80	REC SITE/ YELLOWBOTTOM	BLM	B	C
	OR 16183	PLO 4305	T. 14 S., R. 7 W., SEC 25	133	REC SITE/ ALSEA FALLS	BLM	B	C
	OR 16183	PLO 4537	T. 2 S., R. 7 E., SEC 31	360	REC SITE/ WILDWOOD	BLM	B	C
	OR 16183	PLO 4537	T. 14 S., R. 9 W., SEC 13	10	REC SITE/ MISSOURI BEND	BLM	B	C
	OR 16183	PLO 4537	T. 8 S., R. 4 E., SEC 31	159	REC SITE/ SALMON FALLS	BLM	B	C

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 5344	PLO 4846	T 8 S., R. 10 W., SEC 27	12	ROAD USE	USFS	B	R
	OR 6363	PLO 5136	T. 12 S., R. 7 W., SEC 28	40	ADMIN SITE/AMARYS PEAK	USFS	B	C
	OR 50856	PLO 7215	T . 3 S., R., 10 W., SEC 30		PROTECT LANDS/ PACIFIC COAST HWY	BLM	B	C
	OR 50856	PLO 7215	T . 4 S., R., 10 W., SEC 19 & 29		PROTECT LANDS/ PACIFIC COAST HWY	BLM	B	C
	OR 50856	PLO 7215	T . 5 S., R., 10 W., SECS 5, 6, & 20		PROTECT LANDS/ PACIFIC COAST HWY	BLM	B	C
	OR 50856	PLO 7215	T . 8 S., R., 11 W., SEC 3		PROTECT LANDS/ PACIFIC COAST HWY	BLM	B	C
	OR 50856	PLO 7215	T . 9 S., R., 11 W., SEC 4		PROTECT LANDS/ PACIFIC COAST HWY	BLM	B	C
	OR 50856	PLO 7215	T . 13 S., R., 11 W., SEC 28		PROTECT LANDS/ PACIFIC COAST HWY	BLM	B	C
	OR 50856	PLO 7215	T . 14 S., R., 12 W., SEC 35		PROTECT LANDS/ PACIFIC COAST HWY	BLM	B	C
	OR 18842	PP 477	T. 2 S., R. 4 E., SEC 1	24	ELECTRIC POWER GENERATOR/ SANDY RIVER -MARMOT DAM BULL RUN PROJ	FERC/BLM	B	C
	OR 18842	PP 477	T. 2 S., R. 5 E., SECS 13 & 15	24	ELECTRIC POWER GENERATOR/ SANDY RIVER -MARMOT DAM BULL RUN PROJ	FERC/BLM	B	C
	OR 18884	PP 2195	T. 4 S., R. 4 E., SEC 13	100	ELECTRIC POWER GENERATOR/ CLACKAMAS	FERC/BLM	B	C
	OR 18884	PP 2195	T. 4 S., R. 5 E., SEC 7	97	ELECTRIC POWER GENERATOR/ CLACKAMAS	FERC/BLM	B	C
	OR 19146	PSC 170	T. 7 S., R. 3 & 4 E.,	1879	POTENTIAL PWR DEVELOPMENT/ MOLALLA RVR	BLM	C	R
	OR 19147	PSC 171	T. 8 S., R. 8 W.,	957	POTENTIAL PWR DEVELOPMENT/ SILETZ RVR	BLM	C	R
	OR 19166	PSC 304	T. 5 N., R. 6 & 7 W.,	34	POTENTIAL PWR DEVELOPMENT/ NEHALEM RVR	BLM	C	R

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 19166	PSC 304	T. 3 N., R. 8 W.,	34	POTENTIAL PWR DEVELOPMENT/ NEHALEM RVR	BLM	C	R
	OR 19183	PSC 413	T. 14 & 15 S., R. 8 W.,	316	POTENTIAL PWR DEVELOPMENT/ ALSEA RVR	BLM	C	R
	OR 19038	PSR 89	T. 3 N., R. 8 W.,	61	POTENTIAL PWR DEVELOPMENT/ NEHALEM RVR	BLM	C	R
	OR 19039	PSR 94	T. 6 & 7 S., R. 3 E.,	1325	POTENTIAL PWR DEVELOPMENT/ MOLALLA RVR	BLM	C	R
	OR 19074	PSR 458	T. 12 S., R. 1 W.,	11	POTENTIAL PWR DEVELOPMENT/ SANTIAM RVR	BLM	C	R
	OR 19112	PSR 658, WPD 15	T. 2 S., R. 4 E., T. 3 S., R. 3 E.	5	ELECTRIC TRANS LINES	BLM	C	R
	OR 19113	PSR 659, WPD 14	VARIOUS	6,149	POTENTIAL PWR DEVELOPMENT/ ALSEA, NEHALEM, SCAPPOOSE & TRASK RVRS	BLM	C	R
	OR 19115	PSR 661, WPD 14	VARIOUS	10,370	POTENTIAL PWR DEVELOPMENT/ CLACKAMAS RVR	BLM	C	R
	OR 19118	PSR 664	VARIOUS	1,143	POTENTIAL PWR DEVELOPMENT/ EAGLE CREEK, SO. YAMHILL, MOLALLA AND n. SANTIAM RVRS	BLM	C	R
	OR 19127	PSR 730, WPD 14 & 16	VARIOUS	1,900	POTENTIAL PWR DEVELOPMENT/ CLACKAMAS, NESTUCCA, SANDY, SANTIAM RVRS	BLM	C	R
Note:	Location description indicates sections within which withdrawn lands are located. Information on which portions of the cited sections are withdrawn is available at the District Office.							

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
Eugene	ORE 05555		T.15S., R.7W.	40	Air Navigation	FAA/BLM	A	C
			Section 7					
	ORE 013117	(PLO 3610)	T.18S., R.1E.	81.2	Fall Creek	COE/BLM	B	C
			Section 31		Reservoir			
			T.19S., R.1E.					
			Section 6					
	OR 19234	(PLO 497)	T.17S., R.5W.	5.27	Fern Ridge	COE	A	C
			Section 27		Reservoir			
			Section 28					
	OR 19240	(PLO 727)	T.19S., R.1E.	1.37	Lookout Point	COE	A	C
			Section 34		Reservoir			
	OR 711	(PLO 4395)	T.16S., R.12W.	1	Oregon Islands	USFWS	B	C
			Section 33		National Wildlife			
					Refuge			
	OR 25306	(PLO 6287)	T.16S., R.12W.	1	Oregon Islands	USFWS	B	C
			Section 33		National Wildlife			
	ORE 016183A	(PLO 3869)	T.16S., R.7W.	440.12	Lake Creek	BLM	B	
			Section 19		Whittaker Creek			
			T.18S., R.8W.		Clay Creek			
			Section 21		Haight Creek			
			T.19S., R.7W.		Sharps Creek			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			Section 19		Rec. Sites			
			Section 35					
			T.22S., R.1W.					
			Section 15					
	ORE 012093	(PLO 5490)	*	9000.52	Reserved for	BLM	A	
					multiple use			
					management			
	OR 8754	(PLO 5229)	T.15S., R.1W.	260	Shotgun Creek	BLM	B	
			Section 29		Recreation Site			
			Section 30					
			Section 31					
			Section 32					
	OR 37548	(PLO 6662)	T.20S., R.5W.	832.5	Tyrrell Seed	BLM	B	
			Section 9		Orchard			
			Section 15					
			Section 21					
	OR 46473	(PLO 6963)	T.18S., R.12W.	257.6	Florence	BLM	B	C
			Section 3		Sand Dunes			
			Section 15					
	OR 48744	(PLO 7081)	T.17S., R.3E.	292.25	Eagle Rock	BLM	B	C
			Section 3		Section			
			Section 9		McKenzie			
			Section 10		River			
			Section 11					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 19133**	(PSC 41)	T.19S., R.7W.	550.49	Protect water-	BLM/FERC	A	
			Section 21		power and			
			Section 25		reservoir			
			Section 35		development			
			T.20S., R.6W.		potential			
			Section 5					
	OR 19148**	(PSC 180)	T.20S., R.2W.	300.6	Protect water-	BLM/FERC	A	
			Section 31		power and			
			T.21S., R.1W.		reservoir			
			Section 33		development			
			Section 35		potential			
			T.21S., R.2W.					
			Section 15					
	OR 19164	(PSC 287)	T.18S., R.6W.	120	Protect	BLM/FERC	A	
			Section 5		electric			
					transmission			
					line			
	OR 19186**	(PSC 426)	T.16S., R.2E.	276.64	Protect water-	BLM/FERC	A	
			Section 23		power and			
			Section 24		reservoir			
			Section 27		development			
					potential			
	OR 19040**	(PSR 95)	T.16S., R.2E.	152.28	Protect water-	BLM/FERC	A	
			Section 28***		power and			
			Section 34***		reservoir			
			T.17S., R.2E.		development			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			Section 2***		potential			
			T.17S., R.3E.					
			Section 4					
	OR 19059**	(PSR 285)	T.16S., R.3E.	163.56	Protect water-	BLM/FERC	A	
			Section 31***		power and			
			T.17S., R.3E.		reservoir			
			Section 4		development			
					potential			
	OR 19113**	(PSR 659)	T.15S., R.6W.	5961.48	Protect water-	BLM/FERC	A	
			Section 7		power and			
			T.16S., R.7W.		reservoir			
			Section 19		development			
			T.17S., R.8W.		potential			
			Section 17***					
			T.18S., R.7W.					
			Section 31					
			Section 33					
			T.18S., R.8W.					
			Section 21					
			Section 27					
			Section 35					
			T.19S., R.6W.					
			Section 7					
			Section 9					
			Section 29					
			Section 31					
			T.19S., R.7W.					
			Section 1					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			Section 3					
			Section 5					
			Section 9					
			Section 19					
			Section 21					
			Section 27					
			Section 35					
			T.19S., R.8W.					
			Section 3					
			Section 11					
			Section 13					
			T.20S., R.6W.					
			Section 1					
			Section 3					
			Section 5					
			Section 9					
			Section 11					
			T.20S., R.7W.					
			Section 3					
	OR 19115**	(PSR 661)	T.16S., R.2E.	1103.6	Protect water	BLM/FERC	A	
			Section 33***		power and			
			Section 35***		reservoir			
			T.17S., R.2E.		development			
			Section 1***		potential			
			T.17S., R.3E.					
			Section 3***					
			Section 5***					
			Section 9***					
			T.20S., R.2W.					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			Section 31					
			T.21S., R.1W.					
			Section 31***					
			Section 33					
			Section 35					
			T.21S., R.2W.					
			Section 7					
			T.22S., R.2W.					
			Section 5					
			Section 15					
			Section 23					
			T.23S., R.2W.					
			Section 1					
	OR 19116**	(PSR 662)	T.18S., R.8W.	40	Protect water	BLM/FERC	A	
			Section 28		power and			
					reservoir			
					development			
					potential			
	OR 19127**	(PSR 730)	T.22S., R.1W.	1249.16	Protect water	BLM/FERC	A	
			Section 5		power and			
			Section 9		reservoir			
			Section 15****		development			
			Section 23		potential			
			Section 27					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			Section 35					
			T.23S., R.1W.					
			Section 1					
			Section 7					
	OR 19014**	(WPD 14)	T.15S., R.6W.	8234.24	Protect water-	BLM/FERC	A	
			Section 7		power and			
			T.16S., R.2E.		reservoir			
			Section 33***		development			
			Section 35***		potential			
			T.16S., R.7W.					
			Section 19					
			T.17S., R.2E.					
			Section 1***					
			T.17S., R.3E.					
			Section 3***					
			Section 5***					
			Section 9***					
			T.17S., R.8W.					
			Section 17***					
			T.18S., R.7W.					
			Section 31					
			Section 33					
			T.18S., R.8W.					
			Section 21					
			Section 27					
			Section 35					
			T.19S., R.6W.					
			Section 7					
			Section 9					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			Section 29					
			Section 31					
			T.19S., R.7W.					
			Section 1					
			Section 3					
			Section 5					
			Section 9					
			Section 19					
			Section 21					
			Section 27					
			Section 35					
			T.19S., R.8W.					
			Section 3					
			Section 11					
			Section 13					
			T.20S., R.2W.					
			Section 31					
			T.20S., R.6W.					
			Section 1					
			Section 3					
			Section 5					
			Section 9					
			Section 11					
			T.20S., R.7W.					
			Section 3					
			T.21S., R.1W.					
			Section 31***					
			Section 33					
			Section 35					
			T.21S., R.2W.					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			Section 7					
			Section 31					
			T.22S., R.1W.					
			Section 5					
			Section 9					
			Section 15****					
			Section 23					
			Section 27					
			Section 35					
			T.22S., R.2W.					
			Section 5					
			Section 15					
			Section 23					
			T.23S., R.1W.					
			Section 1					
			Section 7					
			T.23S., R.2W.					
			Section 1					
	OR 19016**	(WPD 16)	T.23S., R.1W.	80	Protect water-	BLM/FERC	A	
			Section 1		power and			
					reservoir			
					development			
					potential			
			T.20S.,R2W.	178.95	Row River Trail	BLM	B	
			Section 30		and associated			
			Section 31		Recreation			
			Section 32		Facilities			
			Section 33					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			Section 34					
			T.20S.,R3W.					
			Section 25					
			Section 36					
			T.21S.,R.1W.					
			Section 19					
			Section 30					
			Section 31					
			Section 32					
			T.21S.,R.2W					
			Section 2					
			Section 3					
			Section 11					
			Section 13					
			Section 14					
			Section 24					
			T.21S.,R.3W.					
			Section 1					
			T.22S.,R.1W.					
			Section 5					
	OR 50856	(PLO7215)	T.18S.,R12W.	36.52	Pacific Coastline	BLM	B	
			Section 2		Highway 101			
	OR 905	(R&PP)	T.14S., R.2W.	2	McKercher	BLM/Linn	B	
			Section 13		County Park	County		
	ORE 06095	(R&PP)	T.16S., R.2E.	61.73	Whitewater	BLM/Lane	B	
			Section 34		County Park	County		
			Section 35					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	ORE 011226	(R&PP)	T.17S., R.2E.	2.4	Martin Rapids	BLM/Lane	B	
			Section 1		County Park	County		
	ORE 012264	(R&PP)	T.16S., R.6W.	2	Solid waste	BLM/Lane	B	
			Section 7		transfer Site	County		
	OR 37243	(R&PP)	T.19S., R.3W.	2.79	Willamette	BLM/State	B	
			Section 35		River	of Oregon		
					Greenway			
	* All public domain lands in and west of Range 8 East and all lands within the area, which become public domain lands in the future.							
	** Withdrawals remaining to be reviewed through the FLPMA withdrawal review process or under authority of DM 603.							
	*** Opened to entry subject to Sec. 24 of the Federal Power Act.							
	**** Opened to entry in part subject to Sec. 24 of the Federal Power Act.							
	Note: Table does not include lands that have been transferred out of Federal ownership subsequent to withdrawal or lands within National Forest boundaries.							
Roseburg	OR 19101	PSR* 629, WPD* 11	20S,7W,25	200	Protect Water	BLM/FERC	C	C
			20S,7W,27	40	Power & Reservoir			
			20S,7W,33	280	Development			
			20S,7W,35	80	Potential			
	OR 16183B	PLO 3869	21S,6W,1	80	Gunter Recreation Site	BLM	B	C
	OR 19101	PSR* 629, WPD* 11	21S,7W,5	352.59	Protect Water	BLM/FERC	C	C
	OR 19011		21S,7W,9	40	Power & Reservoir			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
					Development			
					Potential			
	OR 19112	WPD* 15, PSR* 658	22S,5W,33		Transmission Line	BLM/FERC	C	C
					Purposes (unconstructed)			
	OR 19105	PSR* 633,WPD* 11	22S,7W,19	29.93	Protect Water	BLM/FERC	C	C
	OR 19011		22S,7W,31	17.52	Power & Reservoir			
					Development			
					Potential			
	OR 19105	PSR* 280, 633, WPD* 11	23S,7W,15	94	Protect Water	BLM/FERC	C	C
	OR 19057		23S,7W,23	134.27	Power & Reservoir			
	OR 19011		23S,7W,27	74.2	Development			
			23S,7W,32	1.7	Potential			
			23S,7W,33	118.2				
	OR 19105	PSR* 280, 633, WPD* 11	24S,7W,3	146.05	Protect Water	BLM/FERC	C	C
	OR 19057		24S,7W,11	186.32	Power & Reservoir			
	OR 19011		24S,7W,13	26.62	Development			
			24S,7W,15	122.19	Potential			
			24S,7W,17	116.06				
			24S,7W,20	14.35				
			24S,7W,21	75.58				
			24S,7W,23	40.03				
			24S,7W,28	34.62				
			24S,7W,33	95.2				
	OR 16183B	PLO 3869	24S,7W,13	23.7	Tyee Recreation Site	BLM	B	C
	OR 19341	PLO 754	24S,7W,20	14.35	Timber	BLM	A	C
			24S,7W,21	13.93	Preservation			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 16183B	PLO 3869	25S,1W,23	20	Scaredman	BLM	B	C
			25S,1W,24	40	Recreation Site			
			25S,1W,25	20				
			25S,1W,30	40	Forest			
	OR 16183B	PLO 3869	25S,2W,15	160	Rock Creek	BLM	B	C
					Recreation Site			
			25S,2W,21	320	Mill Pond	BLM	B	
					Recreation Site			
	OR 19105	PSR* 280,	25S,7W,5	37	Protect Water	BLM/FERC	C	C
	OR 19103	630,633,	25S,7W,6	105.25	Power & Reservoir			
	OR 19057	WPD* 11	25S,7W,7	205.49	Development			
	OR 19011		25S,7W,9	78.39	Potential			
			25S,7W,15	13.83				
			25S,7W,17	80				
			25S,7W,21	40				
			25S,7W,23	80				
			25S,7W,27	80				
	OR 3660-A	PLO 4537	25S,7W,9	78.4	Umpqua	BLM	B	C
			25S,7W,10	0.15	Recreation Site			
			25S,7W,15	13.33				
	OR 19144	PSC* 162,	25S,8W,12	20.8	Protect Water	BLM/FERC	C	C
					Power & Reservoir			
					Development Potential			
	OR 44740	Public Law*	26S,2W,7,8,13,14		North Umpqua Wild	BLM	C	C
		100-557	26S,2W,15,16,17,		and Scenic River			
			26S,2W,18,20,21,					
			26S,2W,22,23,24	1620				
	OR 18874	PP 1927*	26S,2W,7		Electric	BLM/FERC	B	C

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			26S,2W,13		transmission line.			
			26S,2W,14		Occupies 100 foot			
			26S,2W,15		wide strip of land.			
			26S,2W,17					
			26S,2W,21					
			26S,2W,29					
			26S,2W,30					
			26S,2W,31	110.11				
	OR 19184	PSC* 416,	26S,2W,7	397.3	Protect Water	BLM/FERC	C	C
	OR 19103, 19057	PSR* 631, 280	26S,2W,13	40	Power & Reservoir			
	OR 19011	WPD* 11,16	26S,2W,14	300	Development Potential			
	OR 19016		26S,2W,15	160				
			26S,2W,17	280				
			26S,2W,21	33.78				
			26S,2W,22	220				
			26S,2W,23	353.94				
			26S,2W,24	250				
	OR 16183B	PLO 3869	26S,2W,14	160	Susan Creek Falls	BLM	B	C
	OR 18874	PP* 1927	26S,3W,1	5.88	Electric Trans-	BLM/FERC	B	
			26S,3W,35	6.29	mission line. Occupies			
					100 foot wide strip of			
					land.			
	OR 5263	PLO 4848	26S,3W,1	80	Swiftwater	BLM	B	C
					Recreation Site			
	OR 16183B	PLO 3869	26S,3W,9	6.44	Lone Rock	BLM	B	C
	OR 19103,19057	PSR* 631,280	26S,3W,1	120	Protect Water	BLM/FERC	C	C
	OR 19011	WPD* 11	26S,3W,9	25+	Power & Reservoir			
		SO Intpr* 83	26S,3W,11	121.44	Development Potential			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 19103	PSR* 631	26S,4W,17	11.56	Protect Water	BLM/FERC	C	C
	OR 19011	WPD* 11			Power & Reservoir			
					Development Potential			
	OR 19057	PSR* 280,	26S,6W,7	139.87	Protect Water	BLM/FERC	C	C
	OR 19105	633,	26S,6W,8	62.43	Power & Reservoir			
	OR 19011	WPD* 11			Development Potential			
		PLO 4521	27S,2W,1	0.8	Negro Creek Road	USDA,FS	B	C
		Executive Order* 865	27S,2W,9	320.4	Umpqua National	USDA,FS	None	C
			27S,2W,32	110.25	Forest			
								C
	OR 5263	PLO 4848	27S,2W,1	80	Emile Creek	BLM	B	
					Recreation Site			
			27S,2W,8	80	Little River	BLM	B	
					Wayside			
	OR 16183B	PLO 3869	27S,2W,16	178.53	Wolf Creek Trail	BLM	B	C
	OR 16183B	PLO 3869	27S,3W,23	80	Cavitt Creek	BLM	B	C
					Forest			C
	OR 13683	PLO 4448	29S,7W,17	40	Umpqua River	BR BLM	B	C
			29S,7W,21	20.22	Reclamation			
					Project			
	OR 19113	PSR* 659,	29S,9W,35	40	Protect Water	BLM/FERC	C	C
	OR 19014	WPD* 14			Power & Reservoir Development Potential			
	OR 13683	PLO 4448	29S,7W,32	58.43	Umpqua River	BR BLM	B	C
					Reclamation			
					Project			
	OR 19152	PSC* 198,	30S,2W,12	80	Protect Water	BLM/FERC	C	C
	OR 19171	315,			Power &			
	OR 19057	PSR* 280,	30S,2W,23	80	Reservoir			
			30S,2W,28	40	Development			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			30S,2W,29	120	Potential			
			30S,2W,31	80				
	OR 3621	PLO 4626	30S,2W,23	1.3	Pickett Butte Road	USDA,FS	B	C
	OR 19171	PSC* 315,	30S,3W,19	120	Protect Water	BLM/FERC	C	C
	OR 19113	PSR*659,	30S,3W,25	120	Power and			
	OR 19011	WPD* 11	30S,3W,29	80	Reservoir			
			30S,3W,31	164.62	Development			
			30S,3W,33	40	Potential			
			30S,3W,35	80				
			30S,4W,15	99.34	Protect Water	BLM/FERC	C	C
			30S,4W,21	80.14	Power and			
			30S,4W,23	161.95	Reservoir			
			30S,4W,25	112.76	Development			
			30S,4W,27	40	Potential			
			30S,4W,29	76.84				
			30S,4W,35	167.76				
	OR 13683	PLO 4448,	30S,7W,5	20	Umpqua River	BR	B	C
			30S,7W,6	31.15	Reclamation			
					Project			
	OR 19113	PSR 659,	30S,9W,3	40	Protect Water	BLM/FERC	C	C
	OR 19014	WPD 14			Power and			
					Reservoir			
					Development Potential			
	OR 19171	PSC* 315	31S,3W,3	83.61	Protect Water	BLM/FERC	C	C
					Power and			
					Reservoir			
					Development Potential			
	16183B	PLO 3869	31S,8W,35	20	Darby Creek	BLM	B	C
					Recreation Site			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 12693	PLO 5490	All Public	18,426	Multiple Use	BLM	D	C
			Domain					
			(PD) lands					
		Small Tract	24S,7W,	4.43	Community	BLM	B	C
		Act	Sec 3; Lot 3		Site Lease			
					OR 011654			
		R&PP	26S,2W,	7.5	County Park	BLM	B	C
			Sec 7; E1/2SE1/4		Lease OR 012162			
		R&PP	26S,	147.99	State Park	BLM	B	C
			2W,		Lease (expired)			
			Sec 23 and 24;		OR 010044			
			Metes and Bounds					
		Small Tract	Sec 15; Lot 6	2.69	Occupancy	BLM	B	R
		Act			Lease OR 05564			
		Small Tract	28S,4W,	0.61	Occupancy	BLM	B	C
		Act	Sec. 13; SE1/4NE1/4		Lease			
					OR 16775			
	OR 53486	PLO 7413	T 31 S, R 7 W,	36.6	Gold Panning Area	BLM	B	C
			Sec. 4	58.72	Island Creek Rec. site	BLM		
	OR 53486	PLO 7413	T 30 S, R 7 W,				B	C
			Sec. 36					
			T 31 S, R 7 W,					
			Sec. 1					
	OR 53486	PLO 7413	T 30 S, R 7 W,	40	Picket Bridge Rec. Site	BLM	B	C
			Sec. 23					
	OR 53486	PLO 7413	T 30 S, R 7 W,	25	Olalla-Thompson Cr. Day	BLM	B	C
			Sec. 5		Use Site			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
Medford	OR016674	PLO 5105		2483.48	Lost Cr. Resv.	Corps of Eng.	B	R 716.88 ac.
	OR016753	PLO 6373		840.59	Elk Cr. Resv.	Corps of Eng.	B	C
	OR49	PLO 4132		200	Sprague Orch.	BLM	B	C
	OR10729	PLO 5481		160	Sprague Orch.	BLM	B	C
	OR04135	PLO 1726		15481.14	Recreation area	BLM	B	R 519.80 ac.
	OR12261	PLO 3165		174.21	Recreation area	BLM	B	Needs review
	OR016183D	PLO 3869		444.35	Recreation area	BLM	B	R
	OR19008	WPD 3		5631.54	Water power	BLM	C	R
	OR19010	WPD 10		12228.88	Water power	BLM	C	Needs review
	OR19013	WPD 13		127.27	Water power	BLM	C	R
	OR19018	WPD 18		872.35	Water power	BLM	C	Needs review
	OR19047	PSR 161		157.49	Power site	BLM	C	Needs review
	OR19048	PSR 167		495.38	Power site	BLM	C	Needs review
	OR19054	PSR 258		1573.16	Power site	BLM	C	R 400 ac.
	OR19078	PSR 528		2.17	Power site	BLM	C	Needs review
	OR19085	PSR 579		313.95	Power site	BLM	C	R
	OR19087	PSR 582		3632.57	Power site	BLM	C	R
	OR19088	PSR 583		1799.03	Power site	BLM	C	R
	OR19089	PSR 584		160	Power site	BLM	C	R
	OR19094	PSR 619		3360.34	Power site	BLM	C	Needs review
	OR19096	PSR 621		5379.4	Power site	BLM	C	Needs review
	OR19100	PSR 625		80	Power site	BLM	C	R
	OR19107	PSR 635		40	Power site	BLM	C	Needs review
	OR19111	PSR 653		127	Power site	BLM	C	R
	OR19121	PSR 686		158.72	Power site	BLM	C	R
	OR19131	PSC 2		6.42	Power site	BLM	C	Needs review
	OR19139	PSC 143		22948.95	Power site	BLM	C	Needs review
	OR19143	PSC 158		71.8	Power site	BLM	C	Needs review
	OR19151	PSC 196		5.94	Power site	BLM	C	R
	OR19154	PSC 218		1482.21	Power site	BLM	C	R

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR19173	PSC 330		1151.73	Power site	BLM	C	Needs review
	OR19174	PSC 340		5207.45	Power site	BLM	C	Needs review
	OR19291	PLO 3530		210.36	Brewer Spr. RNA	BLM	B	C
	OR03664	B.O. of 1-24-1956		875.93	Rogue R. Basin Proj.	Bur. Of Reclamation	B	Needs review
	OR011495	PLO 4289		1132.39	Rogue R. Basin Proj.	Bur. Of Reclamation	C	C
	OR017844	PLO 4037		162.5	Rogue R. Basin Proj.	Bur. Of Reclamation	B	C
	OR20246	S.O. of 1-28-1905		22138.52	Klamath Proj.	Bur. Of Reclamation	B	Maintan 49 ac;revoke 1800 ac.
	OR20519	S.O. of 2-20-1943		84.64	Medford\SV Proj.	Bur. Of Reclamation	B	R
	OR20572	B.O. of 8-18-1950		80	Air Navg. Site	FAA	B	C
	OR03801	PLO 1189		395.5	Recreation area	USFS	B	R
	OR 139	R&PP		3.9	Sanitary lagoon	BLM	B	C
	OR 651	R&PP		200	Sanitary landfill	Jo. County	B	R
	ORE 013905	R&PP		4.2	River access	BLM	B	C
	ORE 010635	R&PP		80	River park	BLM	B	C
	ORE 012309	R&PP		82.69	Jo. Co. park	BLM	B	C
	ORE 013232	R&PP		400	Cathedral Hills Pk.	BLM	B	C
	ORE 013626	R&PP		6.63	Pinehurst Sch.	BLM	B	C
	ORE 015451	R&PP		12.12	Jack. Co. park	BLM	B	C
	ORE 018320	R&PP		41.48	Recreation area	BLM	B	C
	ORE 010368	R&PP		48.56	Jo. Co. park	BLM	B	C

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	ORE 012765	R&PP		46.76	R&PP Classification	BLM	B	R
	ORE 016993	R&PP		35	Recreation area	BLM	B	C
Coos Bay	OR 50856	PLO 7215	19S 12W 1	40.43	Pacific Coastline	BLM		
			26S 14W 28	40.00				
			27S 14W 29	2.26				
			30S 15W 12	40.00				
			32S 15W 4	71.75				
			33S 14W 31	155.16				
			34S 14W 6	40.70				
			34S 14W 33	162.05				
			34S 14W 34	40.00				
			34S 15W 1	7.92			Loc: all	C - serving original purpose, revoke patented parcel.
			38S 14W 4	40.00				
			38S 14W 5	40.00				
			38S 14W 34	34.00				
			39S 14W 23	40.00				
			41S 13W 6	2.56				
			41S 13W 7	0.32				
	OR 016183C	PLO 3869	20S 9W 31	81.29	Smith River Falls Recreation Site	BLM		
			20S 9W 33	3.50	Vincent Creek Recreation Site	BLM		
			23S 10W 2	78.86	Loon Lake Recreation site	BLM		
			27S 10W 4	60.00	Park Creek Recreation Site	BLM		
			27S 10W 18	20.00	Big Tree Recreation Site	BLM		
			30S 9W 9	80.00	Bear Creek Recreation Site	BLM		

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			32S 14 W 12	120.00	Sixes River Recreation Site	BLM		
				443.65				
	OR 23558	SO 12-31-1930	23S 10W 1	51.51	East Shore Recreation Site	BLM	Loc:all	C - Developed Site
		Rec Wdl. No. 43					Loc:all	C - Developed Site
							Loc:all	C - Developed Site
	OR 19291A	PLO 3530	27S 10W 17	590.00	Cherry Creek Natural Area	BLM	Loc:all	C - Developed Site
			27S 10W 18				Loc:all	C - Developed Site
			27S 10W 19				Loc:all	C - Developed Site
			27S 10W 20				Loc:all	C - Developed Site
	OR 6398	PL 181 5-5-1926	27S 11W 35	120.00	Lavern County Park	BLM/Coos County		
			27S 12W 35	160.00	Rock Prairie County Park	BLM/Coos County	Sur: all	
			28S 9W 7	87.72	Judge Hamilton County Park	BLM/Coos County		
			28S 11W 5	80.00	Middle Creek County Park	BLM/Coos County		
			28S 11W 11	80.00	Frona County Park	BLM/Coos County	Sur: all	C - Portecting site, providing for research opportunities
				527.72				
	OR 21318	SO 6-12-1907	40S 13W 11	320.75	Potential National Park	BLM		
			40S 13W 14					
							Loc:all	C - Developed County Park
	OR 19231	EO 11-24-1903	22S 13W 14	71.10	Umpqua Jetty Maintenance	COE	Loc:all	C - Potential for County Park Development

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
							Loc:all	C - Potential for County Park Development
	OR 21901	EO 8-23-1895	22S 13W 13	130.00	Umpqua River Light Station	USCG	Loc:all	C - Potential for County Park Development
							Loc:all	C - Developed County Park
	OR 4011	EO 7-14-1884	26S 14W 2	2.43	Bar Watch	USCG		
			26S 14W 2	2.67	Administrative Site	USCG		
				5.10			Sur: all	R - Not developed, no planned development, no public support for establishment of park or monument.
	OR 19227	EO 7-14-1884	26S 14W 2	2.43	Military Facility	US Navy		
			26S 14W 3				Loc:all	R - COE indicated a desire to relinquish
	OR 22094	EO 6-14-1876	26S 14W 4	35.78	Cape Arago Administative Facility	USCG	Loc:all	R - USCG indicated a desire to relinquish
			26S 14W 9					
							Loc:all	C - serving original purpose
	OR 36343	EO 9-11-1843	26S 14W 4	5.00	Cape Arago Lighthouse	USCG	Loc:all	C - serving original purpose
	OR 12693	PLO 5490	All Public Domain lands	50329.00	Multiple use management	BLM	Loc:all	C - serving original purpose
			on district					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
							Loc:all	R - USCG has submittted an NOI to relinquish
	OR 54142	PLO 7436	25S 13W 4	80.00	North Spit Recreation Area	BLM		
		3-24-2000	25S 13W 5	32.23				
			25S 13W 6	271.60			Loc:all	R - USCG has submittted an NOI to relinquish
			25S 13W 7	212.90				
			25S 13W 8	5.90				
			25S 13W 18	325.49			Sur: agriculture	C - serving original purpose
			25S 13W 19	10.38				
			25S 14W 12	14.85				
			25S 14W 13	232.00				
			25S 14W 23	1.10			Loc:all	C - serving original purpose
			25S 14W 24	398.89				
			25S 14W 25	80.72				
			25S 14W 26	113.21				
				1779.27				
	OR 24294	PL 95-450	26S 14W 5	incl. below	Oregon Islands NWR	USFW		
		10-11-1978	26S 14W 8	incl. below				
			26S 14W 17	incl. below				
			26S 14W 18	incl. below				
			26S 14W 19	15.00				
			27S 14W 19	8.00				
			28S 15W 25	incl. below				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			28S 15W 26	3.56				
			28S 15W 35					
			29S 15W 2	4.00				C - serving purpose
			31S 16W 24	7.00				
			31S 16W 25	16.00				
			31S 16W 34	incl. below				
			31S 16W35	7.00				
			32S 16W 2	54.00				
			32S 16W 3					
			32S 16W 10					
			32S 16W 17	incl. below				
			32S 16W 21	incl. below				
			32S 16W 28	incl. below				
			32S 16W 29	incl. below				
			32S 16W 30	incl. below				
			32S 16W 31	54				
			33S 15W 6	2				
			33S 15W 8	3				
			33S 15W 21	incl. below				
			33S 15W 22	15				
			33S 15W 33	18				
			34S 14W 30					
			34S 15W 31	31.83				
			36S 15W 2	incl. below				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			36S 15W 11	12				
			36S 15W 15					
			36S 15W 16	incl. below				
			36S 15W 17	20				
			38S 14W 30					
			38S 14W 31	12				
			38S 15W 1	16				
			39S 14W 6	7				
			39S 14W 8	inc.in Sec 17				
			39S 14W 16	3				
			39S 14W 17	20				
			40S 14W 4	25				
			40S 14W 16	2				
			40S 14W 22	9				
			40S 14W 26	2.00				
	OR 711	PLO 4395	28S 15W 25	3.56	Oregon National Wildlife Refuge	USFW		
			31S 16W 24	7.00				
			31S 16W 25	16.00				
			31S 16W 34	7.00				
			31S 15W 35	15.00				
			32S 16W 17	incl. below				
			32S 16W 21	incl. below				
			32S 16W 28	incl. below				
			32S 16W 29	incl. below				
			32S 16W 30	incl. below			Loc:all	C - serving original purpose

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			32S 16W 31	54.00				
			33S 15W 21	incl. below				
			33S 15W 22	15.00				
			33S 15W 33	incl. below				
			34S 15W 4	18.00				
			36S 15W 2	incl. below				
			36S 15W 11	12.00				
			38S 15W 1	16.00				
			38S 14W 30	incl. below				
			38S 14W 31	12.00				
			39S 14W 6	7.00				
			39S 14W 16	3.00				
			39S 14W 8	incl. below				
			39S 14 17	3.00				
			40S 14W 4	25.00				
			40S 14W 22	9.00				
				222.56				
	OR 50874		29S 15W 35	70.90	Lost Lake	BLM		
			29S 15W 36					
	OR 45401	PLO 6977	30S 15W 2	94.20	New River ACEC	BLM		
		4-29-1993	30S 15W 3	75.58				
			30S 15W 10	209.00				
			30S 15W 11	80.15				
			30S 15W 15	156.80				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			30S 15W 21	55.14			Loc:all	C - serving original purpose
			30S 15W 22	109.83				
			30S 15W 28	153.10				
			30S 15W 32	2.18				
			30S 15W 33	27.40			Loc:all	C - serving original purpose
				963.38				
	OR 51194	PLO 7170	31S 15W 7	2.89	Floras Lake	BLM		
			31S 15W 8	108.59				
				111.48				
	OR 51891	PLO 7247	32S 14W 6	44.48	Edson Creek Rec Site	BLM		
		2-20-1997						
	OR 24293	PL 91-504	40S 14W 22	21.00	Oregon Islands NWR	USFW		
	OR 22376	PROC 2416	40S 14W 35	21.00	Oregon Islands NWR	USFW	Loc:all	C - serving original purpose
	OR 25306	PLO 6287,	Unsurveyed Islands		Oregon National Wildlife Refuge	USFW		
	OR 11517	EO 5-6-1935,	and rocks	100.00				
			41S 13W 6					C - serving original purpose
								C - serving original purpose
	OR 19130	PSC 01	28S 10W 6	45.26	Protect water power and reservoir	BLM/FERC		

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			28S 10W 8	40.00	development potential			C - serving purpose
			28S 10W 12	40.00				
			28S 10W 14	40.00			Loc:all	C - serving original purpose
				165.26				
	OR 19140	PSC 147	27S 10W 31	115.35	Protect water power and reservoir	BLM/FERC		
			27S 11W 35	236.72	development potential			
			28S 10W 5	124.12				
			28S 11W 6	45.14			Sur: all	R - unless there is substantial evidence that the site is viable for the production of hydropower.
			28S 11W 14	240.00				
				761.33				
	OR 19144	PSC 162	22S 8W 7	181.00	Protect water power and reservoir	BLM/FERC		
		PLO 3414	22S 8W 9	11.07	development potential			
			22S 8W 17	46.78			Sur: all	R unless there is substantial evidence that the site is viable for the production of hydropower.
			22S 8W 21	2.42				
			22S 9W 7	56.44				
			22S 9W 9	50.04				
			23S 8W 13	80.00				
				427.75				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 19152	PSC 198	22S 9W 7	183.93	Protect water power and reservoir	BLM/FERC	Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
	OR 20365	PSR 273	20S 9W 26	85.27	Protect water power and reservoir	BLM/FERC		
			20S 9W 28	44.31				
			20S 9W 32	75.85				
			20S 9W 34	39.79				
				245.22				
	OR 19101	PSR 629/WPD 11	20S 8W 17	39.65	Protect water power and reservoir	BLM/FERC	Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
			20S 8W 19	623.68				
			20S 8W 21	304.23				
			20S 8W 27	120.00			Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
			20S 8W 33	499.01				
			20S 9W 21	40.00				
			20S 9W 25	499.37				
			20S 9W 27	284.81				
			20S 9W 31	232.49				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			20S 9W 33	278.38			Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
			20S 9W 35	173.27				
			21S 8W 1	400.00				
			21S W 11	200.00				
				3694.89				
	OR 19102	PSR 630	22S 8W 24	3.00	Protect water power and reservoir	BLM/FERC		
	OR 19105	PSR 633/WPD 11	22S 7W 19	29.93	Protect water power and reservoir	BLM/FERC		
			22S 8W 5	19.75				
			22S 9W 7	21.32				
			22S 9W 13	149.00				
			22S 9W 17	72.20				
			23S 7W 7	49.10				
			23S 7W 19	151.06				
			23S 7W 21	30.15			Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
			23S 8W 11	29.38				
				551.89			Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 19106	PSR 634/WPD 11	22S 10W 35	239.95	Protect water power and reservoir	BLM/FERC		
			23S 9W 7	41.66				
			23S 9W 17	120.00				
			23S 9W 19	158.55				
			23S 10W 1	171.51				
			23S 10W 13	40.00				
				771.67				
	OR 19109	PSR 645/WPD 12	23S 10W 35	40.00	Protect water power and reservoir	BLM/FERC		
							Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
	OR 19113	PSR 659	30S 9W 9	40.00	Protect water power and reservoir	BLM/FERC		
	OR 19113	PSR 659/WPD 14	26S 9W 17	160.00	Protect water power and reservoir	BLM/FERC		
			26S 9W 19	160.00				
			26S 9W 29	160.00				
			26S 9W 31	360.00				
			27S 9W 7	265.55				
			27S 11W 15	182.80			Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
			30S 9W 17	80.00				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			30S 10W 3	120.00			Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
			30S 10W 13	160.00				
				1648.35			Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
	OR 19017	WPD 17	27S 11W 5	610.66	Protect water power and reservoir	BLM/FERC		
			27S 11W 7	40.00				
			27S 11W 17	40.00				
			27S 11W 19	163.04				
			27S 11W 21	440.00				
			27S 11W 29	480.00				
			27S 11W 31	280.14				
			27S 11W 33	240.00				
			27S 12W 11	186.14				
			27S 12W 13	520.00			Sur: all	Revoke unless there is substantial evidence that the site is viable for the production of hydropower.
			27S 12W 23	200.00				
			27S 12W 25	320.00				
			27S 12W 27	240.00				
			27S 12W 35	220.00				
			28S 9W 7	335.20				
			28S 10W 3	366.60				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			28S 10W 5	329.68				
			28S 10W 9	280.00				
			28S 10W 11	240.00				
			28S 10W 15	80.00				
			28S 11W 1	152.80				
			28S 11W 3	234.00				
			28S 11W 7	32.28				
			28S 12W 1	254.80				
			28S 12W 13	155.68				
			28S 12W 23	161.76				
				6602.78				
	OR 19142	PSC 157			Protect water power	BLM/FERC		
					and reservoir			
K. Falls	OR 5433	BLM Order	40S 10E 9	80	Air navigation	FAA	A	Modify withdrawal, 80 acres
		6/14/57 ANS 57	40S 10E 10	80				continued, 80 acres returned
				160				to BLM, not all land used by
								withdrawing agency.
	OR 36244	SO of 2/11/47	39S 9E 21	51.12	Kingsley Field	USAF	B	Modify withdrawal. Portion
								not needed by holding agency
								portion continued in withdrawal
	OR19001	PLO 5907	39S 13E 2	78.87	Public Water	BLM	D	Not evaluated
			38S 13E 34	40	Reserve 146			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			38S 13E 35	40				
				158.87				
	OR 20219	EO of 1/24/1914	41S 13E 6	52.14	Public Water	BLM	D	Not evaluated
			40S 13E 19	189.55	Reserve 15			
			41S 12E 1	40				
			40S 12E 24	160				
				441.69				
	OR 9041	SO 234	40S 10E 11	80	Public Water	BLM	D	Not evaluated
					Reserve 107			
	OR 9041	SO 214	41S 14.5E 1	640	Public Water	BLM	D	not evaluated
					Reserve No. 107			
	OR 16183E	PLO 3869	39S 13E 2	160	Gerber Reservoir	BLM	B	C -
					recreation site.			BLM's investment still in
								need of protection. Use
								as a developed recreation
								site and campground will
								continue for the duration
								of the plan
			38S 5E 21	80	Surveyor			
					Mountain			
					recreation site	BLM	B	

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			40S 7E 6	14.35	Topsy recreation			
				254.35	site.	BLM	B	
	OR 12799	PLO 3274	39S 9E 21	10.04	Administrative	FWS	B	Transfer jurisdiction of the
					site	FWS	B	10.04 acre administrative
								site to BLM. Site no
								longer needed by Fish
								and Wildlife Service
	OR 6058	PLO 4876	38S 6E 21	9.69	Protect road use	BLM/FS	B	Not evaluated
	OR 5746	PLO 4878	36S 15E 28, 32	14	Protect road use	BLM/FS	B	Not evaluated
				9				
				23				
	OR 20243	SO of 7/9/1904	39S 14E 5	240.05	Klamath Basin	BR/BLM	B	R -
			39S 14E 6	486.36	Reclamation			Withdrawal relinquished by
			39S 14E 7	209.43	Project			holding agency, no longer
			39S 14E 8	240				needed for project
			39S 14E 17	640				purposes. Suitable for
			39S 14E 18	529.98				return to BLM
			39S 14E 19	400				administration.
			39S 14E 20	360				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			39S 14E 21	160				
			39S 14E 22	160				
			38S 14E 31	80				
			38S 14E 32	80				
				3585.82				
		SO of 7/27/1904	38S 13E 35	120	Klamath Basin	BR/BLM	B	R -
			39S 13E 1	80	Reclamation			Withdrawal relinquished
			39S 13E 2	78.87	Project			by holding agency, no
			39S 13E 11	80				longer needed for project
			39S 13E 12	640				purposes. Suitable for
			39S 13E 13	320				return to BLM administration
			39S 13E 14	160				
			39S 13E 23	320				
			39S 13E 26	320				
			39S 13E 27	280				
			39S 13E 33	240				
			39S 13E 34	240				
				2878.87				
	OR 20246	SO of 1/28/1905	37S 8E 17	68.7	Klamath Basin	FWS/BR	B	R -
					Reclamation			Withdrawal relinquished by
					Project/Upper			holding agency, no longer

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
					Klamath National			needed for project purposes.
					Wildlife Refuge			Withdrawal overlaps USFWS
								withdrawal.
	OR 20249	SO of 1/20/1910	34S 6E 2	44.59	Klamath Basin	FS/BR	B	R -
		Lands within	34S 6E 11	438.73	Reclamation			Withdrawal relinquished by
		Winema NF	34S 6E 14	440	Project/Winema			holding agency, no longer
			34S 6E 23	140	National Forest			needed for project purposes.
			34S 6E 26	358.83				Withdrawal overlaps USFWS
			34S 6E 35	242.7				withdrawal.
			36S 6E 10	80				
			36S 6E 11	160				
				1904.85				
	OR 20249	SO of 1/20/1910	34S 6E 25	480	Klamath Basin	FWS/BR	B	R -
		(Continued)	34S 6E 26	120	Reclamation			drawal relinquished by holding
		Same lands	34S 6E 35	200	Project/Upper			agency, no longer needed
		included in	34S 6E 36	640	Wildlife Refuge			for project purposes.
		EO 2416	35S 6E 1	640				Withdrawal overlaps USFWS
			35S 6E 2	280.24				withdrawal.
			35S 6E 12	640				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			35S 6E 13	640				
			35S 6E 24	640				
			35S 6E 35	320				
			35S 6E 36	640				
			36S 6E 1	640				
			36S 6E 2	560				
			36S 6E 3	80				
			36S 6E 11	480				
			36S 6E 12	640				
			36S 6E 13	400				
			36S 6E 14	320				
				8361.84				
	OR 20249	SO of 1/20/1910	34S 6E 1	239.23	Klamath Basin	BR	B	R -
		(Continued)	34S 6E 12	640	Reclamation			Withdrawal relinquished by
			36S 6E 13	316.86	Project			holding agency, no longer
			36S 6E 13	1196.09				needed for project purposes.
								Suitable for return to BLM
								administration.
	OR 20253	SO of 6/25/1919	41S 10E 15	159.8	Klamath Basin	FWS/BR	B	C
		Same lands	41S 10E 16	74.1	Reclamation			
		included in	41S 9E 3	405.2	Project/Upper			
			41S 9E 4	648.4	Klamath National			
			41S 9E 5	405.25	Wildlife Refuge			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			41S 9E 6	324.16				
			41S 9E 8	567.68				
			41S 9E 9	648.76				
			41S 9E 10	647.92				
			41S 9E 14	396.39				
			41S 9E 15	387.32				
			41S 9E 16	373.92				
			41S 9E 17	359.46				
			41S 9E 18	344.8				
			41S 8E 1	344.32				
			41S 8E 4	72.3				
			41S 8E 9	149.5				
			41S 8E 11	40				
			41S 8E 12	324.44				
			41S 8E 13	167.1				
			41S 8E 14	40				
			41S 8E 15	291.2				
			41S 8E 16	91.8				
			40S 8E 24	40				
				7303.82				
	OR 20254	SO of 7/31/1919	39S 11E 19	80	Klamath Basin	BR/BLM	B	R -
					Reclamation			Withdrawal relinquished by
					Project			holding agency, no longer
								needed for project purposes.
								Right-of-way issued to

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
								protect BR interests. Suitable
								for return to BLM administration
	OR 20240	SO of 6/20/1922	41S 14E 19	29.55	Klamath Basin	BR/BLM	B	C
					Reclamation			
					Project			
	OR 20259	SO of 2/25/1939	39S 12E 22	40	Klamath Basin	BR/BLM	B	R -
			39S 12E 26	80	Reclamation			Withdrawal relinquished by
				120	Project			holding agency, no longer
								needed for project purposes.
								Suitable for return to BLM.
								administration.
	OR 20261	SO of 4/2/1940	40S 14E 5	41.04	Klamath Basin	BR/BLM	B	R -
					Reclamation			Withdrawal relinquished by
					Project			holding agency, no longer
								needed for project purposes.
								Suitable for return to BLM.
								administration.

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 20239	SO of 2/21/1946	41S 14E 15	80	Klamath Basin	BR/BLM	B	C -
			41S 14E 20	240	Reclamation			Property still needed for
			41S 14E 21	307.06	Project			project purposes.
			41S 14E 22	354.92				
			41S 14E 23	81.82				
				1063.8				
	OR 20264	BO of 2/11/1947	39S 9E 20	13.3	Klamath Basin	BR/BLM	B	Continue
			39S 9E 21	12.06	Reclamation			or revoke portions of the
			39S 9E 21	1.2	Project			withdrawal as requested by
			39S 9E 22	7.5				holding agency. Property
			39S 9E 25	7.7				no longer needed for project
			39S 9E 27	18.4				purposes. Rights-of-way
				60.14				issued to protect BR interests
								on lands to be returned to
								BLM administration.
		FPC	40S 8E 33	1.52	Protect electric	BLM/FERC	B	Not evaluated
		Order 11/17/1930			transmission line			
	OR 19085	PSR 579	41S 6E 2	80	Protect water,	BLM/FERC	C	Not evaluated
		EO 2/1/1917	41S 6E 7	40	power, and			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			41S 6E 10	80	reservoir			
			41S 6E 18	113.95	development			
				313.95	potential			
	OR 19087	WPD 3	41S 6E 2	440	Protect water,	BLM/FERC	C	Not evaluated
		Same lands	41S 6E 3	480	power, and			
		included in	41S 6E 5	40	reservoir			
		PSR 582	41S 6E 7	412.58	development			
			40S 6E 1	151.54	potential			
			40S 6E 11	240				
			40S 6E 13	550.15				
			40S 6E 23	578.25				
			40S 6E 27	280				
			40S 6E 35	312.53				
			41S 5E 13	30.54				
				3615.19				
	OR 19054	PSR 258	41S 6E 4	40	Protect water,	BLM/FERC	C	Not evaluated
		EO 4/13/1912	41S 6E 8	360	power, and			
			41S 6E 10	80	reservoir			
			40S 6E 12	294.03	development			
			40S 6E 14	216.09	potential			
			40S 6E 26	288.15				
			40S 6E 34	309.83				
			41S 5E 13	23.24				
				1611.34				
	OR 43211	Power	40S 6E 14	45	Protect water,	BLM/FERC	B	Not evaluated
		project 10199	40S 6E 23	147.15	power, and			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
		Salt Caves	40S 6E 26	150.32	reservoir			
		proposal	40S 6E 27	13.56	development			
			40S 6E 34	115.7	potential			
			40S 6E 35	76.28				
			41S 6E 3	76.53				
			41S 6E 5	28.08				
			41S 6E 7	146.13				
			41S 6E 8	111.86				
			41S 6E 9	168.92				
			41S 6E 10	8.79				
			41S 5E 1	8.15				
			41S 5E 12	11.89				
			41S 5E 13	13.98				
				1122.34				
	OR 18974	Power	40S 7E 6	14.47	Protect J.C.	BLM/FERC	B	Not evaluated
		project 2082	40S 6E 1	23.41	Boyle power			
			40S 6E 12	67	project.			
			40S 6E 13	40.74				
			40S 6E 14	27.33				
			40S 6E 23	16.68				
			40S 6E 26	7.4				
			40S 6E 27	1.23				
			40S 6E 34	2.8				
			40S 6E 35	11.17				
			41S 6E 3	8.24				
			41S 6E 10	4.89				
				225.36				

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
	OR 19131	PSC 2	41S 5E 12	6.42	Protect water,	BLM/FERC	C	Not evaluated
		SO 5/19/1921			power, and			
					reservoir			
					development			
					potential.			
	OR 43472	Power project	40S 10E 11	200	Protect water,	BLM/FERC	B	Not evaluated
		10518-000	40S 10E 14	240	power, and			
		preliminary	40S 10E 24	120	reservoir			
		permit		560	development			
					potential			
	OR 42356	Power	40S 13E 30	80	Protect water,	BLM/FERC	B	Not evaluated
		project 10233	40S 13E 31	400	power, and			
		preliminary	41S 12E 1	120	reservoir			
		permit	41S 13E 6	640	development			
			41S 13E 7	360	potential			
			41S 13E 8	40				
			41S 13E 17	200				
			41S 13E 18	40				
			41S 13E 19	40				
			41S 13E 20	80				
				2000				
	OR 46064	Power	40S 13E 35	40	Protect water,	BLM/FERC	B	Not evaluated
		project 10897	41S 13E 5		power, and			
		preliminary	41S 13E 6		reservoir			
		permit Russell	41S 13E 7		development			
		Canyon	41S 13E 8		potential			
			41S 13E 9					

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
			41S 13E 17					
			41S 13E 18					
	OR 47193	Power	40S 10E 11	200	Protect water.	BLM/FERC	B	Not evaluated
		project 11136	40S 10E 14	240	power, and			
		preliminary	40S 10E 24	120	reservoir			
		permit Stukel		560	development			
		Mountain			potential			
	OR 49194	Power	40S 10E 11	200	Protect water,	BLM/FERC	B	Not evaluated
		project 11138	40S 10E 14	240	power, and			
		preliminary	40S 10E 24	120	reservoir			
		permit Stukel		560	development			
		Mountain			potential			
	OR 46064	Power	40S 12E 12	640	Protect water,	BLM/FERC	B	Not evaluated
		project 10897			power, and			
		preliminary			reservoir			
		permit Lorella			development			
		pumped storage			potential			
		project.						
	OR 46244	Power	40S 13E 7	497.11	Protect water,	BLM/FERC	B	Not evaluated
		project 10970	40S 13E 8	360	power, and			
		preliminary	40S 13E 17	280	reservoir			
		permit Smith	40S 13E 18	292.05	development			

District	Serial Number	Authority	Legal Description	Acres	Purpose/Name	Managing Agency	Segregation Effect	Recommendation (C/R)
		Reservoir		1429.16	potential			
		pumped storage						
		project						

* PLO: Public Land Order

PSR: Power Site Reserve

PSC: Power Site Classification

R&PP: Recreation and Public Purposes

WPD: Water Power Designation

** A: Withdrawn from operation of the general land laws, the Mining law, and the Mineral Leasing Act

B: Withdrawn from operations of the General Land and Mining Laws

C: Withdrawn from operation of the General Land Law

Recommendation Continue-C Revoke-R

Table 287. Land Tenure Zone 3 Lands.

District	Township	Range	Section	Subdivision	Acres	Status
Medford	34 S	6 W	22	NW¼SE¼;	40	PD
			33	SW¼SW¼; E½SW¼;	120	PD
			35	NW¼NE¼;	40	PD
	35 S	1 W	15	NW¼SE¼;	40	OC
	35 S	5 W	31	SE¼NW¼, SW¼, W½SE¼;	240	PD
			32	SW¼NE¼; W½SE¼, NE¼SE¼;	160	PD
	35 S	6 W	5	S½NE¼, SE¼SW¼, SE¼;	240	
			7	NE¼NE¼, N½NW¼, SW¼NW¼, SE¼NE¼;	200	
			11	E½NE¼, SW¼NE¼, NE¼SE¼;	200	
			14	NW¼SE¼;	40	PD
			17	NE¼NE¼, NW¼NW¼;	80	
			19	NE¼, N½NW¼;	240	
			21	NE¼NE¼;	40	
			29	NW¼NW¼;	40	
			30	S½S¼;	80	PD
			31	SW¼NE¼, W½, NW¼SE¼;	400	
			33	E½NE¼, E½NW¼, NW¼NW¼, SE¼SE¼;	240	
	36 S	3 W	21	NE¼SW¼;	40	
			33	SW¼SW¼, NW¼SE¼SW¼;	50	
			35	NE¼NE¼;	40	
	36 S	4 W	25	SE¼SW¼, S½SW¼SE¼;	60	
			35	Lots 1, 5, W½SW¼;	126.78	
	36 S	5 W	4	E½NW¼, N½SW¼;	160	PD
			5	SE¼NE¼, E¼SE¼;	80	
			9	W½E½, E½W½, E½NW¼SW¼;	340	
			29	S½SW¼;	80	PD
	36 S	6 W	1	Lots 2,3,4, S½NE¼, N½SW¼, SE¼NW¼, W½SE¼, SE¼SE¼;	440.20	
			3	SW¼, S½SE¼	240	
			4	W½W½	160	PD
			5	E½SE¼, SW¼NW¼, W½SW¼;	200	
			8	W½SE¼, SE¼SE¼;	120	PD
			9	N½NW¼, SW¼NW¼, E½SE¼;	200	
			11	NW¼NE¼;	40	
			17	N½N½;	160	
			30	NW¼SW¼;	40	PD
			31	NW¼NW¼;	40	
			33	SE¼NE¼;	40	

District	Township	Range	Section	Subdivision	Acres	Status
	37 S	3 W	1	Lot 8;	13.82	PD
			4	Mineral Survey located NW¼NW¼;	4.28	PD
			5	Lot 1, NE¼NE¼;	40	
	37 S	5 W	5	NE¼NW¼, SW¼NW¼, NW¼SW¼;	120	
			7	W½SW¼;	80	
			18	W½SW¼;	80	PD
	37 S	6 W	3	SE¼NE¼, NE¼SE¼;	80	
			8	NE¼NE¼;	40	PD
			9	NE¼, N½SW¼, SE¼SW¼, W½SE¼, NE¼SE¼;	400	
			11	N½NW¼;	80	
			13	SW¼SE¼, E½SE¼;	120	
			15	NE¼NE¼, SW¼NE¼, SE¼NW¼;	120	
			24	NW¼NE¼;	40	PD
	38 S	1 W	21	Lot 1, NE¼SW¼, S1/2SW¼	147.04	
	38 S	2 W	10	NE¼NW¼;	40	PD
			28	Lot 1	5	PD
	38 S	4 W	17	NE¼NE¼;	40	
			25	Lot 7	9.26	
	39 S	1 W	1	NE¼NE¼;	40	
	39 S	2 W	18	NW¼NE¼SW¼;	10	PD
	40 S	8 W	1	Lots 7, 8;	11.53	
			5	Lots 6, 7;	21.21	
			7	Lots 1,2, E½SW¼, W½SE¼;	202.34	
	32 S	2 E	17	NW¼SW¼SW¼SW¼;	2.5	PD
	33 S	2 E	1	SE¼SW¼;	40	PD
	36 S	1 E	6	SE¼SE¼;	40	PD
	36 S	2 E	34	SE¼SW¼, SW¼SE¼;	80	PD
	37 S	1 E	15	SE¼NW¼;	40	
	38 S	1 E	3	SW¼NW¼;	40	
			5	SE¼NE¼;	40	
	38 S	2 E	34	SW¼NW¼, NW¼SW¼;	80	PD
				TOTAL MEDFORD DISTRICT	7,203.96	
Eugene	14 S	2 W	13	Lots 4-5 (part)[2]	2.001	O&C
	17 S	3 W	15	Lots 6, 9	1.303	O&C

District	Township	Range	Section	Subdivision	Acres	Status
	16 S	5 W	33	Lots 4-8	6.57	O&C
	16 S	6 W	7	Lot 6	3.76	O&C
	16 S	7 W	11	NW¼SE¼ (part)	2.5[1]	O&C
	17 S	1W	3	Lot 6	0	SOLD
	18 S	1 W	5	Lot 8 (part)	0.501	O&C
	18 S	1 W	26	Lot 7	1.68 (reduced from 2.89 acres due to sale of lots 8, 9, and 10)	PD
	18 S	7 W	11	NE¼NE¼ (part)	3.001	O&C
	18 S	10 W	11	Lot 9	6.24	PD
	19 S	3 W	35	Lot3[2]	2.79	O&C
	19 S	4 W	29	NE¼SW¼ (part)	0.361	O&C
	21 S	1 W	31	Lot 13	1.42 (reduced from 3.62 acres due to cadastral survey and sale of a portion)	O&C
	21 S	1 W	35	Lot 2	0	SOLD
				TOTAL EUGENE DISTRICT	22.77	

[1]Acreage is approximate until cadastral survey is completed.
[2]Tract may be sold only to current R&PP lessee so long as case is in effect.
[3]Actual acreage may vary due to erosion and accretion.

Roseburg	30 S	2 W	32	Lot 3	42.00	PD
	30 S	2 W	34	SESW	40.00	PD
	31 S	2 W	4	Lots 1 and 8	84.00	PD
	24 S	3 W	9	W2W2	160.00	O&C
	24 S	3 W	15	E2NE,W2SE,SESE	200.00	O&C
	24 S	3 W	17	Lots 1,2,3, and 4	154.00	O&C
	24 S	3 W	19	Lots 5 to 12 inclusive	217.00	O&C
	24 S	3 W	21	NWSW	40.00	O&C
	24 S	3 W	22	SWNE, NWSW	80.00	PD
	24 S	3 W	23	NWNW	40.00	O&C
	24 S	3 W	31	Lot 1, N2NE, SWNE, E2NW,SESE	281.00	O&C
	25 S	3 W	3	Lot 5,6,7, and 8	98.00	O&C
	25 S	3 W	4	Lot 5	23.00	PD
	25 S	3 W	5	Lots 5 and 6	52.00	O&C
	25 S	3 W	9	Lots 1 to 5 inclusive	223.00	O&C
	27 S	3 W	34	SESW	40.00	PD
	30 S	3 W	5	Lots 1 and 2	19.00	O&C
	21 S	4 W	19	NWSE	40.00	O&C

District	Township	Range	Section	Subdivision	Acres	Status
	21 S	4 W	31	SWSW, S2SE	122.00	O&C
	21 S	4 W	33	S2SW	80.00	O&C
	22 S	4 W	7	NE, NWNW, NESE	250.00	O&C
	23 S	4 W	7	Lot 4, NENE, SESW, W2SE,SESE	240.00	O&C
	23 S	4 W	17	All	640.00	O&C
	23 S	4 W	19	Lots 2,3,4, NE, SENW, E2SW	407.00	O&C
	23 S	4 W	20	SWNE, NWSE	80.00	PD
	23 S	4 W	29	N2NW, SENW, NESW, SWSW	200.00	O&C
	24 S	4 W	5	Lots 3 and 4, W2SE	154.00	O&C
	24 S	4 W	25	N2, NWSW, SE	520.00	O&C
	24 S	4 W	29	NESE	40.00	O&C
	24 S	4 W	33	SE	160.00	O&C
	24 S	4 W	35	W2NE, E2NW, SWNW, N2SW	280.00	O&C
	25 S	4 W	3	NENW, NWSE	82.00	O&C
	25 S	4 W	16	NENW	40.00	PD
	25 S	4 W	17	Lot 5	17.00	O&C
	26 S	4 W	10	Lot 1	7.00	PD
	26 S	4 W	17	Lots 9 and 10	12.00	O&C
	27 S	4 W	7	Lot 2	4.00	O&C
	27 S	4 W	33	NWSW	40.00	PD
	28 S	4 W	29	SENE	40.00	O&C
	30 S	4 W	1	Lot 9	4.00	O&C
	21 S	5 W	13	NESW, W2SE	120.00	O&C
	21 S	5 W	21	NENW	40.00	O&C
	21 S	5 W	25	S2NE, E2NW, NESE	200.00	O&C
	21 S	5 W	27	E2NE, NESW	120.00	O&C
	21 S	5 W	29	NESW	40.00	O&C
	21 S	5 W	33	W2NW	80.00	O&C
	22 S	5 W	1	Lots 1,2,3, and 4, S2N2, S2	634.00	O&C
	22 S	5 W	3	Lots 1,2, SWNE, S2NW	197.00	O&C
	22 S	5 W	5	NWNE, N2NW, SWNW, NWSW	206.00	O&C
	22 S	5 W	11	NE1/4, SWNW, W2SW	280.00	O&C
	22 S	5 W	15	N2NE, SWNE	120.00	O&C
	22 S	5 W	19	SENE	40.00	O&C
	22 S	5 W	23	NESE, S2SE	120.00	O&C
	22 S	5 W	25	SWNE, S2NW, SW, W2SE	360.00	O&C
	22 S	5 W	33	W2NE, NW, NESW	280.00	O&C
	22 S	5 W	35	Lot 1, E2NE, N2NW	180.00	O&C
	23 S	5 W	5	NW, N2SW, SESW	276.00	O&C
	23 S	5 W	7	NWNE, SESE	80.00	O&C
	23 S	5 W	13	E2NE, SE	240.00	O&C
	23 S	5 W	17	S2SW	80.00	O&C

District	Township	Range	Section	Subdivision	Acres	Status
	23 S	5 W	21	NWNW	40.00	O&C
	24 S	5 W	29	Lot 5	28.00	O&C
	25 S	5 W	23	NESW	40.00	O&C
	25 S	5W	27	N2NW	80.00	O&C
	25 S	5W	29	S2NE	80.00	O&C
	28 S	5 W	23	SWNW	40.00	O&C
	28 S	5 W	28	NWNW	40.00	PD
	28 S	5 W	29	E2NE	80.00	O&C
	28 S	5 W	31	NESE	40.00	O&C
	29 S	5 W	29	NENE	40.00	O&C
	30 S	5 W	9	Lots 3 and 4	77.00	O&C
	30 S	5 W	13	Lot 1	21.00	O&C
	30 S	5 W	17	NENE, N2NW, SWNW	160.00	O&C
	30 S	5 W	19	Lot 1	38.00	O&C
	30 S	5 W	29	SESW, S2SE	120.00	O&C
	31 S	5 W	4	Lot 6	33.00	O&C
	22 S	6 W	15	SESW	40.00	O&C
	22 S	6 W	23	W2NW, SW1/4, S2SE	320.00	O&C
	22 S	6 W	35	S2S2	160.00	O&C
	23 S	6 W	1	Lots 5,6, and 7	134.00	O&C
	24 S	6 W	27	W1/2, SWSE	360.00	O&C
	25 S	6 W	3	NWNE, NESW, NESE	122.00	O&C
	25 S	6 W	7	Lots 1,2,3, and 4, E2NW	244.00	O&C
	25 S	6 W	33	SESE	40.00	O&C
	26 S	6 W	3	SENE, NESE	80.00	O&C
	26 S	6 W	17	Lot 2, SENW, SESW, SWSE	126.00	O&C
	29 S	6 W	17	Lots 9,10, and 11, SESE	102.00	O&C
	29 S	6 W	19	NWNE, N2NW, SWSE	164.00	O&C
	30 S	6 W	18	Lots 1 and 2	39.00	PD
	30 S	6 W	20	Lots 1,2, and 3	58.00	PD
	30 S	6 W	21	NWNE, NENW, SE	240.00	O&C
	30 S	6 W	25	SESE	40.00	O&C
	30 S	6 W	29	N2NW	80.00	O&C
	28 S	7 W	11	SWSE	40.00	CBWR
	28 S	7 W	14	Lot 1, N2NE	99.00	PD
	28 S	7 W	15	Lots 7 to 13 inclusive	197.00	CBWR
	28 S	7 W	21	N2, N2S2, SWSW	520.00	CBWR
	28 S	7 W	22	SENE, S2NW	120.00	PD
	28 S	7 W	27	Lots 3 and 4	85.00	CBWR
	29 S	7 W	5	NWSW	40.00	O&C
				TOTAL ROSEBURG DISTRICT	13352.00	

District	Township	Range	Section	Subdivision	Acres	Status
Salem	3 N	1 W	9	Lot 8	1.24	Ot
	3 N	8 W	10	NWNE	40.00	PD
	3 N	8 W	11	Lot 2	0.01	PD
	3 N	8 W	18	Lot 2	21.44	PD
	5 N	6 W	6	Lot 9	2.12	PD
	5 N	7 W	10	SWNE	40.00	PD
	7 N	4 W	6	Lot 7	0.03	PD
	9 N	7 W	32	Lot 8	0.72	PD
	1 S	3 W	7	Lot 1	0.18	OC
	1 S	3 W	8	Lot 1	0.05	PD
	1 S	4 W	15	SWNE, S/2NW	120.00	OC
	2 S	2 E	4	Lot 2	0.04	PD
	2 S	2E	9	Lot7	0.11	Ot
	2 S	3 E	23	Lots 8, 12	6.25	OC
	2 S	3 E	25	Lots 7, 8	1.69	OC
	2 S	3 W	23	N/2NE, NENW	120.00	OC
	2 S	4 W	31	Lot 1	1.30	OC
	2 S	9 W	4	M&B	5.30	Ot
	2 S	9 W	7	UN Lot	0.19	PD
	3 S	2 E	7	Lot 1	0.87	OC
	3 S	3 E	1	Lots 11, 14	54.51	OC
	3 S	3 E	7	NESW	40.00	OC
	3 S	3 E	9	Lot 3, NW, W/2SE	270.40	OC
	3 S	3 E	15	Lot 6, 10-12	45.93	OC
	3 S	3 E	19	NWNE, NENW	80.00	OC
	3 S	3 E	25	Lots 9-11	24.17	OC
	3 S	3 E	27	Lot 7, SENE, SWSE	103.32	OC
	3 S	3 E	29	Lot 4, SESW, W/2SE	146.65	OC
	3 S	3 E	33	NW	160.00	OC
	3 S	3 E	35	NE, NW	320.00	OC
	3 S	4 E	31	UN Lot, Lot 5	57.66	OC
	3 S	4 W	33	Lot 4	0.11	OC
	3 S	9 W	19	NENW	40.00	PD
	3 S	9 W	20	NWNE	40.00	PD
	3 S	9 W	21	SWSW	40.00	PD
	3 S	9 W	28	SWSE	40.00	PD
	3 S	9 W	31	S/2SE	80.00	PD
	3 S	9 W	33	NWNE	40.00	PD
	3 S	10 W	30	Lot 15	0.45	PD
	4 S	1 E	21	Lot 1	0.49	OC
	4 S	2 E	11	NENE, SWNE, E/2SW, NWSE	200.00	OC
	4 S	2 E	15	NWSE, SESE	80.00	OC

District	Township	Range	Section	Subdivision	Acres	Status
	4 S	2 E	23	SWNW	40.00	OC
	4 S	2 E	33	Lots 1, 2	1.80	OC
	4 S	3 E	9	SWNE, NWSE	80.00	OC
	4 S	3 E	19	UN Lot	47.31	OC
	4 S	3 E	21	E/2NE, SWNW, N/2SW	200.00	OC
	4 S	3 E	29	E/2NE	80.00	OC
	4 S	3 E	31	S/2NE, NWSE	120.00	OC
	4 S	1 W	22	UN Lot	0.50	PD
	4 S	3 W	2	Lot 1	0.25	PD
	4 3	3 W	26	Lot 14	6.75	PD
	4 S	3 W	34	Lots 1, 2	4.40	PD
	4 S	3 W	35	Lot 13	8.34	OC
	4 S	10 W	19	Lot 1, 15	77.75	PD
	4 S	10 W	28	Lot 3	0.53	PD
	5 S	3 W	4	Lot 1	1.16	PD
	5 S	3 W	11	Lot 1	15.06	OC
	5 S	4 W	27	Lot 1	13.00	OC
	5 S	5 W	13	Lot 3	0.05	OC
	5 S	5 W	31	Lot 1	3.57	OC
	5 S	5 W	34	Lot 1	0.93	PD
	5 S	5 W	35	Lot 1	8.00	OC
	5 S	10 W	5	UN Lots	2.07	PD
	5 S	10 W	20	SENE	40.00	PD
	5 S	10 W	34	N/2NE, NENW	120.00	PD
	6 S	3 W	2	Lot 2	0.20	PD
	6 S	3 W	5	Lot 1	2.00	OC
	6 S	1 E	13	E/2NW, SWNW	120.00	OC
	6 S	1 E	25	NWNE, SENW	80.00	OC
	6 S	6 W	35	Lot 1	28.40	OC
	6 S	10 W	20	NESW, NWSE	80.00	PD
	6 S	10 W	26	NWNW	40.00	PD
	6 S	10 W	35	SENE	40.00	PD
	7 S	1 E	1	SESW	40.00	OC
	7 S	1 E	23	SESE	40.00	OC
	7 S	3 W	29	Lot 3	5.42	OC
	7 S	6 W	34	SWSE	40.00	OC
	7 S	10 W	20	NE	160.00	PD
	7 S	10 W	30	W/2NE, SENE, E/2SE	200.00	PD
	8 S	1 E	3	SWNW, SW	200.00	OC
	8 S	1 E	27	NESW	40.00	OC
	8 S	1 E	35	Lots 1,2, NWNW, S/2	400.22	OC
	8 S	4 W	24	M&B	1.54	Ot

District	Township	Range	Section	Subdivision	Acres	Status
	8 S	4 W	25	M&B	8.00	Ot
	8 S	10 W	20	WNWNW	20.00	PD
	8 S	11 W	3	Lot 8	4.73	PD
	9 S	1 W	21	Lot 7, NWNE	84.21	OC
	9 S	3 W	21	Lot 3	0.08	Ot
	9 S	3 W	24	UN Lot	1.40	PD
	9 S	3 W	32	Lot 2	4.60	PD
	9 S	4 W	9	Lot 5	1.16	OC
	9 S	4 W	14	Lot 9	0.17	PD
	9 S	5 W	32	Lots 1, 2	2.90	PD
	9 S	9 W	19	Por Lot 29	10.00	PD
	9 S	9 W	33	Lot 17	20.00	PD
	9 S	9 W	34	W/2NWSW	20.00	PD
	9 S	:10 W	26	SWNW	40.00	PD
	9 S	10 W	36	POR Lots 5, 6	10.00	PD
	9 S	11 W	1	Lot 6	1.46	PD
	9 S	11 W	4	SWSW	40.00	PD
	10 S	2 W	8	Lot 1	6.13	PD
	10 S	3 W	24	Lot 6	0.90	PD
	10 S	4 W	11	Lot 5	1.52	OC
	10 S	5 W	19	Lots 1-4, NE, E/2NW, E/2SW	480.00	OC
	10 S	5 W	23	Lot 4	0.79	OC
	10 S	5 W	29	NENE, N/2SW, NSE	145.00	OC
	10 S	6 W	22	Lots 2, 3	15.70	PD
	10 3	7 W	18	SWNE, SESW, W/2SE	160.00	PD
	10 S	10 W	2	Lot 20	20.00	PD
	11 S	3 W	1	Lot 11	0.15	Ot
	11 S	7 W	14	Lot 5	0.14	PD
	11 S	7 W	23	Lots 1, 2	1.39	Ot
	11 S	8 W	6	NESW, NWSE, SESE	120.00	PD
	11 S	9 W	31	Lot 2	43.25	PD
	11 S	10 W	12	N/2NE, NWSW, NESE	160.00	PD
	11 S	10 W	14	Lot 1	2.87	PD
	11 S	10 W	15	Lot 13	3.85	PD
	11 S	10 W	23	NESE	40.00	PD
	11 S	10 W	24	SWSW	40.00	PD
	11 S	10 W	25	Lot 1	37.22	PD
	11 S	10 W	36	SESE	40.00	PD
	12 S	3 E	23	SESW, SWSE	80.00	PD
	12 S	4 E	30	SESW	40.00	PD
	12 S	4 E	31	Lot 1, NENW	84.81	PD
	12 S	1 W	34	Lot 10	11.45	PD

District	Township	Range	Section	Subdivision	Acres	Status
	12 S	2 W	13	Lot 6	7.04	Ot
	12 S	4 W	1	Lot 3	0.23	OC
	12 S	6 W	35	Lot 3	0.20	Ot
	12 S	8 W	6	Lot 7	40.18	PD
	12 S	8 W	7	Lots 1, 2	79.04	PD
	12 S	9 W	29	E/2NE, SESE	120.00	PD
	12 S	9 W	32	E/2NE, SWNE	120.00	PD
	12 S	9 W	34	NENW	40.00	PD
	12 S	9 W	35	NENW, S/2SW	120.00	PD
	12 S	10 W	6	SWSE	40.00	PD
	12 S	10 W	14	NENE	40.00	PD
	12 S	10 W	25	SW, SE	320.00	PD
	12 S	10 W	35	NESE	320.00	PD
	12 S	11 W	9	Lots 5-8, SWNW	201.76	PD
	12 S	11 W	10	Lots 3, 4	76.16	PD
	12 S	11 W	17	Lot 5	38.84	PD
	13 S	3 E	9	NENE	40.00	PD
	13 S	3 E	24	N/2NE, SENE	120.00	PD
	13 S	2 W	21	NWNE	40.00	OC
	13 S	4 W	30	Lot 5	8.49	PD
	13 S	5 W	29	Lot 1	0.84	OC
	13 S	9 W	5	SW	160.00	PD
	13 S	9 W	10	E/2NE, NESE	120.00	PD
	13S	9 W	13	NWNW	40.00	PD
	13 S	9 W	20	S/2SW, SWSE	120.00	PD
	13 S	11 W	3	SWSE	40.00	PD
	13 S	11 W	22	Lots 19, 20	78.23	PD
	13 S	11 W	23	Lot 3	39.15	PD
	13 S	11 W	26	E/2SE	80.00	PD
	13 S	11 W	28	Lot 9	7.60	PD
	13 S	11 W	33	NESE	40.00	PD
	14 S	5 W	25	Lot 1	0.26	OC
	14 S	11 W	3	Lots 1, 2, 25	111.50	PD
	14 S	11 W	4	Lots 29, 30	84.30	PD
	14 S	11 W	5	Lot 10	40.62	PD
	14 S	11 W	6	Lot 16	40.00	PD
	14 S	11 W	10	Lots 1, 11-13, 17	210.21	PD
	14 S	11 W	15	NESE	40.00	PD
	14 S	12 W	35	SENE	40.00	PD
	15 S	5 W	6	Lot 5	1.46	PD
	15 S	9 W	1	Lot 3, SENW, NESE	20.94	OC
				TOTAL SALEM DISTRICT	9505.41	

District	Township	Range	Section	Subdivision	Acres	Status
Klamath Falls	40S	6E	1	Metes and Bounds	(1.62) 1.01	SOLD
	41S	7E	13	NENE	40.00	
				LOT 4	24.69	
	38	8	31	LOT 4	10.30	
	39	8	6	LOT6	27.20	
			7	LOT5	16.90	
			33	LOT 1 (unpatented portion)	4.42	
	40	8	17	SWSE	40.00	
			21	SWSE	40.00	
			22	LOT 4	38.00	
			28	SENE,W1/2NE,NWSE	160.00	
			32	S1/2NE	80.00	
	41	8	8	NWNW,S1/2N1/2, E1/2SW,SE	440.00	
			17	NENE	40.00	
	37	9	4	SWSW	40.00	SOLD
			6	SENW	40.00	
			7	NENE	40.00	
			8	E1/2SW	80.00	
			9	NWNW,NESW	80.00	SOLD
			17	W1/2E1/2, NENW	200.00	
			20	N1/2NE, SENE	120.00	
			21	SWNW,NWSW,SESW	120.00	
			28	W1/2NW,SWNE,NWSE,SESE	200.00	
			35	SENE,W1/2NE,NWSE	40.00	SOLD
	38	9	3	SENE,SESE	80.00	
			5	SWSE	40.00	
			8	NENE	80.00	
			9	NWNW,SESW	80.00	
			15	SWSW	40.00	
	40	9	23	SWNW,NWSW,SESW	40.00	
			35	N1/2NE, SENE	120.00	
	37	10	12	S1/2SE	80.00	
			13	NENW	40.00	
	38	10	6	LOT 5	39.80	
				LOT 6	39.96	
				LOT 7	40.12	
			6	SWNW, N1/2SW	120.00	SOLD
				NESW	40.00	
			7	NENE, NENW	80.00	
			27	NESW, S1/2SW	120.00	
			28	W1/2E1/2, SESE	200.00	

District	Township	Range	Section	Subdivision	Acres	Status
			30	LOT2	39.80	
				LOT 3	39.72	
				LOT 4	39.66	
			31	LOT 1	39.65	
				LOT 2	39.75	
				LOT 3	39.85	
				E1/2E1/2, SWNE, E1/2SW	280.00	
			32	N1/2NE, SWNE,SWNW,W1/2SW, SE	400.00	
			33	W1/2NE, N1/2SW, SESW,W1/2SE	280.00	
			34	N1/2NW	80.00	
			35	NESW	40.00	
	39	10	4	LOT 1	41.40	
				LOT 2	41.40	
				LOT 3	41.50	
				S1/2NE,SENW,N1/2SW,SWSW	240.00	
			5	LOT 2	41.03	
				LOT 3	41.68	
				LOT 4	40.34	
				S1/2NE, SESE	120.00	
	37	11	15	NWNW	40.00	
			23	NWNW	40.00	
			26	SW	160.00	
			27	E1/2SW, SE	240.00	
			29	N1/2SW, SESW	120.00	SOLD
			30	N1/2SE	80.00	SOLD
			33	SENW, W1/2SE	120.00	
			34	E1/2., NENW,N1/2SW, SESW	480.00	
			35	W12, S1/2NE, SE	560.00	
	38	11	1	W1/2SW, SESW	120.00	
			2	LOT 4	41.43	
			3	LOT 1	41.46	
				LOT 2	41.35	
				LOT 3	41.24	
				S1/2NE, SENW,SE	280.00	
			10	E1/2, E1/2NW, NESW	440.00	
			11	SWSW, S1/2SE	120.00	
			12	SWNE, W1/2NW, SENW, N1/2SW, SESW, E1/2SE	360.00	
			13	W1/2NE, NW, E1/2SW, W1/2SE	400.00	
			14	W1/2NE, N1/2NW, SENW, E1/2SE, SESE	320.00	
			17	NWNE, E1/2SE	120.00	
			22	S1/2NE, N1/12SE, SESE	200.00	

District	Township	Range	Section	Subdivision	Acres	Status
			23	E1/2, S1/2SW	400.00	
			26	N1/2NE, SENE, W1/2	440.00	
			32	NESW, NWSE	80.00	
			35	W1/2, E1/2NE, SWNE	440.00	
	39	11	2	LOT 1	40.24	
				LOT 3	39.60	
				LOT 4	80.00	
			33	E1/2NE	80.00	
	41	11	34	NESW	40.00	SOLD
			34	SWNW, W1/2SW	120.00	
	37	111/2	13	E1/2NW	80.00	SOLD
			14	SENE	40.00	SOLD
			17	SESW	40.00	SOLD
			20	NESE	40.00	SOLD
			21	NWNE, S1/2NE, N1/2NW, N1/2SE, SESE	320.00	SOLD
			22	W1/2SW, SESW	80.00	SOLD
			26	NENW	40.00	SOLD
			27	NWSW	40.00	SOLD
			28	W1/2NW, SENW, NWSW, SWNE	200.00	SOLD
			29	E1/2SW, SENE, E1/2SW	200.00	SOLD
	38	12	5	W1/2SW, SESW	803.00	
			6	NESE	40.00	
	39	12	21	NENE	40.00	
			26	NWSE, SESE	80.00	
			27	E1/2SE	80.00	
			28	NESW	40.00	
			34	NENE	40.00	
	40	12	10	NENE, SENW, W1/2SE	160.00	
			11	LOT 1	41.20	
			14	SENW, N1/2SW, SWSW, NWSE	200.00	
			15	N1/2NE, SESW, N1/2SW	200.00	
			19	N1/2NE, SENE	120.00	
			20	N1/2N1/2, SENE, NESE	240.00	
			21	SWNE, E1/2, NESE	400.00	
			22	SWNE, SENW, SWSW	120.00	
			26	W1/2SE, SESE	120.00	
			27	W1/2NE, SENE, W1/2NW, SENW	240.00	
			28	E1/2NW	80.00	
			35	NENE	40.00	
	37	13	1	LOT 5	9.88	
				LOT 7	9.88	

District	Township	Range	Section	Subdivision	Acres	Status
			11	NWSE, SESE	40.00	
	40	13	35	SWNE	40.00	
	41	13	14	NENW	40.00	SOLD
	37	14	10	NWNE, N1/2SWNE, N1/2S1/2SWNE	70.00	
	41	14	5	NESE	40.00	
	36	15	30	Lot 1	40.25	
				Lot 2	40.18	
				Lot 3	40.11	
				Lot 4	40.04	
				E12W1/2, E1/2	480.00	
			32	ALL	640.00	
	37	15	4	LOT 1	40.73	
				LOT 2	41.03	
				LOT 3	40.91	
				LOT 4	40.64	
				LOT 5	40.11	
				LOT 6	40.21	
				LOT 7	40.54	
				LOT 8	40.64	
				LOT 11	40.02	
				LOT 12	39.96	
				LOT 13	40.13	
				LOT 14	40.19	
				TOTAL KLAMATH FALLS	17432.14	
Coos Bay	19S	12W	1	Lots 1, 2	40.48	PD
	20S	9W	33	Lot 7	3.98	O&C
	20S	10W	31	Por. Lot 10	5.98	Acq.
	21S	11W	36	Por. Lot 9		
	21S	11W	31	Lot 11	40	PD
	21S	11W	32	Lots 16, 23	59.01	PD
	22S	8W	15	Lot 9, 10	25.3	O&C
			21	Lots 7, 14	2.42	O&C
			24	Por. Lot 7	3	PD
	22S	9W	7	Por. Lot 6	10.64	O&C
	22S	13W	14	Lots 1, 2	71.1	PD
	25S	11W	30	Lot 5	39.92	PD
	25S	13W	4	N1/2NW1/4	80	PD
	25S	13W	7	Lots 6, 8, 13, 14, 15 (zoned future industrial)	92.78	PD
	25S	13W	18	Lot 7, E1/2NW1/4 (zoned future industrial	96.15	PD
	26S	8W	10	SE1/4NE1/4	40	PD

District	Township	Range	Section	Subdivision	Acres	Status
	26S	11W	8	NW1/4NE1/4	40	PD
	26S	12W	9	Por. SE1/4SW1/4	4	Acq.
	26S	14W	3	Pors. Lots 1, 2, SE1/4NW1/4	62.18	PD
	26S	14W	28	NW1/4NE1/4	40	PD
	28S	12W	19	SE1/4SE1/4	40	CBWR
	30S	12W	5	Lot 6	1.8	O&C
	30S	12W	6	Lots 3, 4	1.14	PD
	30S	13W	21	N1/2NE1/4NW1/4	20	PD
	32S	14W	7	N1/2SWNENW	5	PD
	32S	15W	4	NE1/4SE1/4NE1/4,		
				S1/2NE1/4NE1/4,		
				W1/2SE1/4NE1/4,		
				Lots 1, 2, 3, 4	71.75	PD
	39S	12W	8	W1/2NW1/4	80	PD
				TOTAL COOS BAY DISTRICT	976.63	

Inventory of Communication Sites

The following Table contains information on existing communication sites. Chapter 2 of the Draft EIS contains management actions related to management of communication sites.

Table 288. Inventory of Communication Sites.

District	Site Name	Serial No.	Twn.	Range	Section	Quarter Sec.	Lat	Long.
Coos Bay	Roman nose	OR 8652	19 S	9 W	23	NWNE, NENW	43-54-50N	122-44-00W
Coos Bay	Johns's Peak	OR 53660	23 S.	9 W	27	SESW	43-31-56N	123-45-41W
Coos Bay	Blue Ridge	OR 36189	26 S	12 W	35	SESW	43-16-34.7N	124-5-24.5W
Coos Bay	Signal Tree	OR 8651	29 S	9 W	33	NWSW	43-00-07N	123-46-28W
Coos Bay	Sugar Loaf	None	29 S	12 W	23	NE	43-02-48N	124-05-14W
Coos Bay	Bennett Butte	OR	30 S	13 W	20	NENW	43-57-38N	124-16-27W
Coos Bay	Edson Butte	OR 46648	31 S	14 W	23	SWNW	43-52-20N	124-20-03W
Coos Bay	Grizzly Mountain		37 S	14 W	4	Lot 15	42-23-50N	124-21-55W
Coos Bay	Bosley Butte	OR 16304	39 S	13 W	10	SWSE	42-12-33N	124-13-25W
Coos Bay	Palmer Butte		40 S	13 W	10	Lot 10	42-7-36N	124-12-34W
Coos Bay	Black Mound	OR 60391	40 S	13 W	20	NWNWSW	42-5-17N	124-18-52.83W

District	Site Name	Serial No.	Twn.	Range	Section	Quarter Sec.	Lat	Long.
Eugene	Badger Mountain	OR 55473, OR 48253, ORE 02880, OR 59637, OR 34510	17 S.	7 W.	35	Lot 7	44.05073 N	123,5015 W
Eugene	Brickerville	Vacant	18 S.	10 W.	3	Lot 5	44.03375 N	123.886 W
Eugene	Vaughn Hill	Vacant	18 S.	6 W.	5	SE, SW4NE4	44.03641 N	123.4373 W
Eugene	Amy Road	OR 15674	16 S.	7 W.	1	NW, SW	44.20898 N	123.4823 W
Eugene	Hawley Butte	OR 56656, OR 43048	21 S.	1 W.	29	Lot 7	43.71797 N	122.8375 W
Eugene	Huckleberry Mountain	OR 51261,	24 S.	1 W.	6	Lot 21	43.51053 N	122.8571 W
Eugene	Horse Rock	OR 53355, OR 02743	15 S.	2 W.	1	Lot 4	44.30092 N	122.8831 W
Eugene	Buck Mountain	ORE 017963, OR28799	16 S.	2 W.	7	Lot 1	44.19825 N	122.9851 W
Eugene			16 S.	3 W.	1	S2SE		
Eugene	Mt. Tom	Vacant	15 S.	2 W.	31	SW	44.21592 N	122.9784 W
Eugene	South McGowan	Vacant	16 S.	2 W.	31	NW	44.13768 N	122.9786 W
Eugene	Windy Peak	Vacant	16 S.	8 W.	27	SW	44.14644 N	123.6521 W
Eugene	Elk Mountain	Vacant	16 S.	8 W.	26	NE	44.15383 N	123.622 W
Eugene	Black Canyon	Vacant	17 S.	2 W.	7	SW	44.10226 N	122.9794 W
Eugene	Camp Creek Ridge	Vacant	17 S.	2 W.	15	NE	44.09592 N	122.9066 W
Eugene	High Point	Vacant	19. S	6 W.	23	NW	43.9065 N	123.3783 W
Eugene	Eagle's Rest	Vacant	20 S.	1 W.	12	NE	43.8471 N	122.7465 W
Eugene	Cougar Mountain	Vacant	20 S.	3 W.	1	NE	43.86457 N	122.9869 W
Eugene	Laurel Butte	Vacant	22 S.	3 W.	23	SE	43.64147 N	123.0066 W
Eugene	Hobart Butte	Vacant	22 S.	3 W.	1	NW	43.61182 N	123.0993 W
Salem	Bald Mountain	OR049380	3S	6W	29	NW¼SW¼	45° 17' 00"	123° 25' 50"
Salem	Brightwood	OR 044996, OR 054285, OR 054287, OR 060816	2S	6E	14	SE¼NW¼	45° 24' 50"	122° 02' 15"
Salem	Dixie Mountain	OR005491	2N	2W	27	NW¼NE¼	45° 42' 00"	122° 55' 00"
Salem	Goat Mountain	OR034944	5S	4E	14	SW¼SW¼	45° 07' 52"	122° 17' 16"
Salem	High Heaven	OR018080	3S	5W	33	NW¼SE¼	45° 15' 53"	123° 18' 33"
Salem		ORE000172	3S	5W	33	NW¼SE¼	45° 15' 53"	123° 18' 33"
Salem	Mt. Horeb	OR002086	9S	4E	17	NE¼NE¼	44° 47' 35"	122° 20' 21"
Salem	Prairie Mtn.	ORE005555	15S	7W	7	LOT 11	44° 16' 48"	123° 35' 05"
Salem	Prairie Mtn. East	OR042998	15S	7W	4	SE¼SE¼	44° 16' 37"	123° 36' 31"
Salem	Prairie Mtn. West	OR039808	15S	7W	7	LOT 12	44° 16' 47"	123° 35' 22"

District	Site Name	Serial No.	Twn.	Range	Section	Quarter Sec.	Lat	Long.
Salem	Prospect Hill	OR046839	8S	4W	25	LOT 2	44° 51' 14"	123° 07' 19"
Salem	Snow Peak	OR047462	11S	2E	5	LOT 12	44° 39' 30"	122° 36' 15"
Salem	Tater Hill	OR016808	4N	3W	27	SW¼SW¼	45° 47' 45"	123° 03' 00"
Salem	Trask Mountain	OR047588	2S	6W	29	NE¼NW¼	45° 22' 17"	123° 27' 18"
Salem	Yellowstone Mountain	OR013666	11S	3E	32	SW¼NW¼	44° 34' 04"	122° 28' 57"
Medford	Mt. Bluie						42.2256N	123.1629W
Medford	Beacon Hill						42.2706N	123.1750W
Medford	Mt. Sexton						42.3700N	123.2200W
Medford	Mt. Baldy						42.1944N	123.1117W
Medford	Gilbert Peak						42.2932N	123.1842W
Medford								
Medford	Chestnut Mt.						42.1397N	122.4408W
Medford	Mt. Isabelle						42.3034N	123.1036W
Medford	Soda Mtn.						42.0648N	122.4780W
Medford	Squires Peak						42.2190N	123.0330W
Medford	Tallowbox						42.1966N	123.1504W
Medford								
Medford	King Mountain						42.6920N	123.2294W
Medford								
Medford	Flounce Rock						42.4360N	122.3650W
Medford	Wolf Ridge						42.4582N	122.5113W
Medford	Fielder Mountain						42.2688N	123.1273W
Medford	Tin Pan Peak						42.2558N	123.0899W
Medford	Elk Mountain						42.3240N	123.1498W
Medford	Nuggett Butte						42.2700N	123.0333W
Roseburg	Kenyon Mountain		30S.	9W.	3	NW	42.5944N	123.4531W
Roseburg	Canyon Mountain		31S.	5W.	3	SW	42.5436N	123.1706W
Roseburg	West of Tiller		30S.	2W.	31	SW		
Roseburg	Yellow Butte		23S.	6W.	27	NW	43.3207N	123.2413W
Roseburg	Lane Mountain		27S.	4W.	25	NE	43.1144N	1230710W
K Falls	Stukel	OR 48956					42.1010N	121.6342W
K Falls		OR 35373						
K Falls		OR 46312						
K Falls		OR 52152						
K Falls	Hamaker	OR 15231					42.0679N	121.9699W
K Falls		OR 36377						
K Falls		OR 36541						
K Falls		OR 36562						
K Falls		OR 37192						

District	Site Name	Serial No.	Twn.	Range	Section	Quarter Sec.	Lat	Long.
K Falls		OR 45051						
K Falls		OR 46180						
K Falls		OR 56655						
K Falls		OR 56235						
K Falls		ORE 09843						
K Falls		ORE 10866						
K Falls		ORE 05614						
K Falls		ORE 10317						
K Falls		ORE 15790						
K Falls	Yaniax	OR 39227					42.3264N	121.2684W
K Falls	Buck Butte	OR 55670					42.0921N	121.4432W
K Falls		OR 2231						
K Falls	Brady Butte	OR 2087					42.0166N	121.0340W

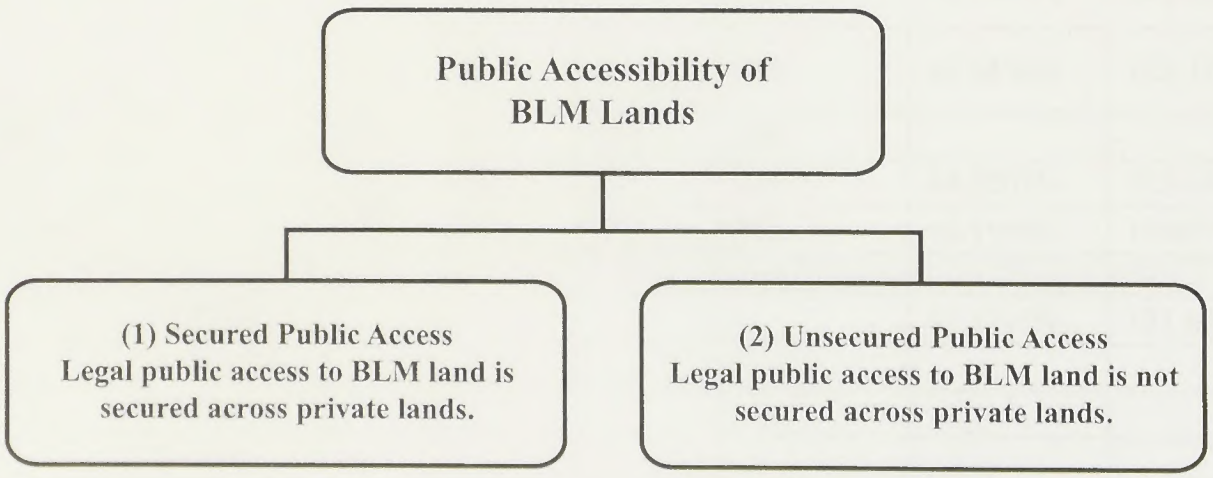
Analytical Methods to Determine Legal Public Accessibility of BLM Lands in the Planning Area

Purpose

Since a majority of BLM lands in western Oregon are intermingled with private lands, public access opportunities can vary greatly. Reciprocal right-of-way agreements, easements, and unsecured access rights across adjacent private lands all have a determining affect on the availability of legal public access to BLM lands.

This analysis is not designed to distinguish between motorized and non-motorized use areas, seasonal use restrictions, or consider other resource management constraints associated with public use. Nor does this analysis consider natural barriers that may affect public access (e.g. steep topography, dense vegetation, impassible rivers, etc.). Only the legal accessibility of BLM lands for the public will be determined primarily using existing agency transportation database information. A small percentage of BLM lands are legally accessible to the public other than via the road network (i.e. navigable waterways, coastal beaches, trail systems, etc.). These other access options will be considered as part of the analysis either in the actual calculations or in the narrative for each BLM district.

Public access categories described in the flowchart below will be assigned to all distinct management units of BLM land throughout western Oregon. A distinct management unit is defined by a contiguous block of BLM land, not including BLM lands that are joined by corners. Each access category is further defined on the next page.



It is important to note that this analysis will only determine if the public can legally access a distinct management unit, not if a particular management unit provides roaded access throughout it. In some cases, a road may only access a small portion of a management unit; where as the remainder of the unit would require cross-country travel to reach. In this instance, the entire management unit is considered legally accessible to the public.

(1) Secured public access: Public access rights to a distinct management unit of BLM land have been secured by the United States. Physical access must be present and available via the general transportation road network, a navigable waterway, coastal beach, or trail systems. Public access rights are generally included in the acquisition of exclusive or access road easements where the U.S. has acquired control of the right-of-way. However, individual access documents should be reviewed and used as the determining factor where necessary.

(2) Unsecured public access: Public access rights to a distinct management unit of BLM land have not been secured by the United States. Administrative access is legally and/or physically available to the BLM via the general transportation road network; however, associated reciprocal right-of-way agreements or non-exclusive easements do not include legal access rights for the public. Individual access documents should be reviewed and used as the determining factor where necessary.

Legal public access may not be secured to certain distinct management units; however, the public may currently be allowed to access these BLM lands at the consent of the adjacent private landowner. In fact, a number of BLM recreation sites do not have secured legal public access to them. Due to the difficulty and sensitivity of mapping private lands that provide unsecured public access to BLM lands, this analysis is not designed to map these occurrences. BLM districts may decide to conduct a follow-up analyzes to determine the extent of this type of unsecured public access in order to improve management of these areas.

Methods

Part I. Geographic Information System Mapping

Step 1.

Develop a digital layer of distinct management units of BLM land for each district – using the 'dissolve' tool.

Step 2.

Identify which access routes (line segments) on the BLM's transportation system have secured legal public access rights using the selected 'access rights' attribute from the BLM's ground transportation road network database described below. Legal public access is available to a distinct management unit where a management unit boundary intersects with an access route from a public road in which all of the line segments contain one of the following designation in the "*acc_rgt*" attribute field.

- BP = BLM Public Access
- FP = USFS Public Access
- OF = Other Federal Agency
- CO = County
- ST = State

Step 4.

Determine which distinct management units do not have secured legal public access using the remaining 'access rights' attributes of the ground transportation road network (flowchart box 2): *Located in field acc_rgt.* (The remainder of the BLM lands should be captured with this step.)

- BA = BLM Administrative Access
- BR = BLM Reciprocal Right-of-Way Agreement
- FA = USFS Administrative Access
- NO = No Legal Access
- PV = Private only
- UK = Unknown (also shown as "NKN")
- Blank (This will capture all roadless blocks of BLM land surrounded by private lands.)

Step 5.

Map the location and calculate total acreage for all distinct management units having either secured or unsecured legal public access for each district by land status (O&C lands, Coos Bay Wagon Road lands, Public Domain lands, and Acquired lands) (Flowchart boxes 1 and 2).

The scale of these maps must be large enough for the Realty, Roads, and Recreation Specialists to analyze the data. It may take 10 or more maps to cover the entire land base for most districts. Develop a template for each map that displays the following information:

(1) District boundary lines

(2) Distinct management units of BLM land (using a distinct boundary type). Distinct management units will be identified using a reproducible color code or symbol based on one of the following attributes:

- Secured legal public access (see Step 2 above)
- Unsecured legal public access (see Step 3 above)

(3) Road line segments (using distinct colors and thicknesses), based on the following attributes:

- Secured public access (based on the attributes in Step 3 above)
- Unsecured legal public access (based on the attributes in Step 4 above)
- A thicker line for BLM roads with maintenance levels 3 or higher. (This will help the Road Specialists orient the transportation system for their analysis.)
- BLM Road numbers (e.g. 18-5-12)
- US, State, and County Highways/Roads
- County and State roads and highways labeled accordingly

(4) Township, range, and section numbers

Step 6.

The District Geographic Information System Specialists will then print out the maps provided to them by the Geographic Information System Project Coordinators. Once the maps have been printed, they will then be passed on to the Realty and/or Road Specialists.

Part II. Analysis of Maps

Step 1.

The District Realty and/or Road Specialists verify the Geographic Information System outputs and quality control the maps. The maps must be reviewed for accuracy of attribute data that may affect public access to each distinct management unit of BLM land. This quality control process should answer that all the distinct management units correctly color-coded as "Secured Public Access" or "Unsecured Public Access?" All errors should be corrected by marking up the maps using the following two rules:

- If a block is incorrectly color-coded as "Secured Public Access," circle the letters "UPA" in the center of the block, meaning the block should changed to "Unsecured Public Access."
- If a block is incorrectly color-coded as "Unsecured Public Access," circle the letters "SPA" in the center of the block, meaning the block should changed to "Secured Public Access."

This quality control check may be used in the future to correct errors in FAMS database and the Ground Transportation Road Network "access rights." However, for purposes of this analysis, it is only necessary to mark up the paper copies of the maps.

Step 2.

After the district maps have been analyzed by the realty and/or road specialists, they will then coordinate with the district recreation planners for a final evaluation. This is necessary so that the recreation planners can consider other public access options other than via the road network (i.e. navigable waterways, coastal beaches, trail systems, etc.). Once all changes have been incorporated, the maps will then be mailed to the Geographic Information System staff in the State Office who will arrange for a contractor to incorporate all the necessary changes to produce final maps.

Part III. Development of Final Results

Update digital coverages for each district in western Oregon based on the marked-up maps provided by each BLM District in western Oregon. The final product will include:

(1) BLM district maps of public accessibility routes and distinct management units of BLM land identified by one of the following attributes:

1. Secured legal public access
2. Unsecured legal public access

(2) Spreadsheets that calculate the total number of acres per attribute and a percentage of the total land base for each district by land status (O&C, CBWR, PD and Acquired).



Appendix P. Energy and Minerals

This appendix provides detailed background on mineral and energy developments.

In this appendix:

Reasonably Foreseeable Mineral and Energy Developments 1437

Proposed Restrictions and Requirements on Mineral and Energy Exploration and Development Activity 1478

Reasonably Foreseeable Mineral and Energy Developments

SUMMARY

Table 289. Fluid Mineral Development Potential

	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls
Conventional O/G	68 wells associated with the Mist Gas Field	N/A	N/A	3 exploration wells	N/A	N/A
Seismic Notices of intent	Expected to be confined to existing road systems; negligible effects			Expected to be confined to existing road systems; negligible effects		
Road construction	¼ mile per well@ 40 ft = 82 acres disturbance			¼ mile per well@ 40 ft = 4 acres disturbance		
Well pad	2 acres per well= 136 acres			2 acres per well = 6 acres		
Collection pipe:	assume 25% well success; 2 miles per well; 30 ft wide= 124 acres			No discoveries; no pipe; no disturbance		
Plug & abandon wells	No additional effect			No additional effect		
Coal Bed Natural Gas	Exploration only	N/A	N/A	37 to 77 wells	N/A	N/A
Seismic Notices of intent	Expected to be confined to existing road systems; negligible effects			Expected to be confined to existing road systems; negligible effects		
Road construction				¼ mile per well@ 40 ft = 45- 90 acres disturbance		
Well pad				Assume 4 wells per pad; 2 acres per pad =19 -38 acres disturbance		
Collection pipe:				Assume 50% well success; Assume most collection pipe along existing transportation system; new disturbance = 5-10 linear miles at 30 ft wide = 18-36 acres		
Plug & abandon wells				No additional effect		

	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls
Geothermal	N/A	N/A	N/A	N/A	N/A	See below

For Klamath Falls Resource Area:

Geophysical Exploration (includes seismic reflection and gravity/magnetic field surveys):
- Notices of Intent: 2; Very small acres disturbed
- Exploratory Wells: 1-2: 0.1 acre per site; .25 acre per well for roads. 0.35-0.7 acres total disturbance

Geothermal Operations:

-Notices of Intent:
Surface Geophysical Surveys: 6: very limited surface disturbance

Temperature Gradient Holes: 5: 0.1 acre per site; .25 acre per well for roads. 2.25 acres total disturbance

Exploration wells: 5 wells; One acre per well pad; 40 ft. wide ROW @ 0.5 mile per well = 17 acres total disturbance

Geothermal Power Plant Development:
1 possible in the life of the plan; if proposed, evaluate separately in cooperation with the State.

Direct Use of Geothermal Energy for space heat:
2 possible; evaluate separately if proposed

Table 290. Saleable Mineral Development Scenario Summary for 2008-2018.

	Roseburg	Salem	Eugene	Coos Bay	Medford	Klamath Falls
New quarries	1	5	2	5	3	1-2 new
Acres disturbed	2 acres per + ½ acre for access	2 acres per + ½ acre for access	2 acres per, + ½ acre for access	2 acres per, + ½ acre for access	2 acres per + ½ acre for access	2-3 acres per + ½ acre for access
Existing quarries	60; 6 expanded @ 2 acres per	38 existing, 8 expanded less than 2 acres per	71 existing, 4 expanded at approximately 1 acre each	32 existing; 6 expanded @ less than 2 acres each	188 existing quarries; 10% expanded @ less than 1 acre per + 1/10 acre per for new access	18 quarry & cinder sites used intermittently;
depletions	10 quarries	2 quarries	2 quarries	One quarry	5 quarries depleted	Up to 4
Decorative stone		3 to 6 sales per year	1 to 2 sales per year		750 sales over the 10 year period	1-2 sales per year

Table 291. Locatable Mineral Development Scenario.

	Roseburg	Salem	Eugene	Coos Bay	Medford	Klamath Falls
Instream suction dredging notices		2	2		50	2
Bench Placer notices	2	10	6	6	80	0
Roads	0.3 acres per	0.3 acres per	0.3 acres per	0.3 acres per	Of 80 estimated, 10 would have roads at ½ acre per notice	

	Roseburg	Salem	Eugene	Coos Bay	Medford	Klamath Falls
Test pits, support facility	1 acre per notice	1 acre per notice	1 acre per notice	1 acre per notice	1 acre per notice on average	
Notice to plan	1	1	?	1	0	0
Vein notices	2	4	4	one	100 notices; surface disturbance 1-5 acres per notice	4
Roads	3 per notice 40x200= ½ acre per notice	3 per notice 40X200=1/2 acre per notice	3 per notice 40x200= ½ acre per notice	3 per notice 40x200= ½ acre per notice	Mostly existing roads; minimal temporary roads; estimate ½ acre for ½ of the notices zero acre for the other half of the notices	Mostly existing roads; minimal temporary roads
Support facilities	1 acre per notice	1 acre per notice	1 acre per notice	1 acre per notice	1 acre for ½ of the notices (many current notices take ore off site for processing)	
Sample sites	½ acre per notice	½ acre per notice	½ acre per notice	½ acre per notice	Ten holes per notice; 0.1 acre per hole; estimate 1/5 of the notices will drill hole	Ten holes per notice; 0.1 acre per hole;
Plans of operation	one	One	one	one	15 (lode & placer)	0
Exploratory holes	5; 0.1 acre per hole; roads 40x300= 0.75 acre	Ten; 0.1 acre per hole; roads 40x300= 0.75 acre	Ten; 0.1 acre per hole; roads 40x300= 0.75 acre	Ten; 0.1 acre per hole; roads 40x300= 0.75 acre	Ten; 0.1 acre per hole; roads 40x300= 0.75 acre. Estimate ½ of the plans will be lodes and have exp holes	
Support facility	1 acre	1 acre	1 acre	1 acre	1 acre per plan	
2nd phase exploration						
Roads	5 (standard as above)= 2.5 acres	10 (standard as above)= 2.5 acres	10 (standard as above)= 2.5 acres	10 (standard as above)= 2.5 acres	Mostly existing roads; minimal temporary roads; estimate ½ acre for ½ of the plans; zero acre for the other half of the plans	
Drill pads	5 holes, 0.1 acre per hole	10 holes, 0.1 acre per hole	10 holes, 0.1 acre per hole	10 holes, 0.1 acre per hole	10 holes, 0.1 acre per hole; on ¼ of the plans	
Mine development						
Bench placer	one; 1 acre	One, 7.5 acres	one; 7.5 acres		Eight of the plans are estimated to be bench placers at five acres per plan	

	Roseburg	Salem	Eugene	Coos Bay	Medford	Klamath Falls
Lode	one	one	none		Seven of the plans are estimated to be lodes with one requiring a 25 acre heap leach	
Surface excavation	1 acre	10 acres			5 acres per plan	
Stockpile topsoil	1 acre	2acres			1 acre per plan	
Support facility	1 acre	2acres			1 acre per plan	
Roads	1 acre	2 acres			Less than 1 acre per plan	
Mineral processing	Done elsewhere	Done elsewhere			One acre for ½ of the plans	
Silica sand deposit		One	*	one		0
Mine site		21 acres		20 acres		
Stockpile heavy minerals		One acre		2 acres		
vegetation stockpile		One acre		½ acre		
Office & magnetic separation		One acre		One acre		
Laterite placer plan of operation				One plan		0
Exploratory Holes drilled				10 @ 0.1 acre per hole		
New temporary Roads				0.75 acres total		
Support facility				One acre		
2nd phase exp:						
Temporary roads				2.5 acres total		
Ten additional drill holes				One acre total		
Recreational mining	5 notices; 2 acres total	30 notices; 7.5 acres total	30 notices; 7.5 acres total	30 notices; 7.5 acres total	800 Estimate 300 acres, this is disturbance only under the water level	See suction dredging above

* Eugene footnote: Locatable minerals with silica sand potential withdrawn from mineral entry in the Florence area. However, sand is excavated and removed from BLM property near Florence, Oregon, on an easement granted to the adjacent landowner

Salem District

The District is located in northwest Oregon, bound by the Pacific Ocean to the west, the Columbia River to the North, the crest of the Cascade Mountain Range to the East, and the Salem District/Eugene District boundary to the south. It encompasses lands in thirteen different counties that include Clatsop, Columbia, Multnomah, Tillamook, Washington, Clackamas, Yamhill, Marion, Polk, Lincoln, Benton, Linn and Lane Counties. It is expected that most District public domain and O & C Railroad lands will be available for leasing, subject to guiding stipulations.

Estimating how much oil and gas exploration and development will occur on federal lands managed by the Salem District during the next ten years is based on an existing gas field designation within the District boundary and historical Oil and Gas investigations.

The first exploration well was drilled near Newberg, Oregon in 1902. Conventional petroleum in the District has been the focus of numerous studies. Two periods of intense search for petroleum occurred from 1920 to 1940 and 1940 to 1960. These investigations have resulted in one developed field, the Mist Gas Field, with a discovery well in 1979. However, small amounts of gas have been found throughout the District boundaries, with sedimentary basins projected.

Review of Oil and Gas Occurrence Potential, Oil and Gas System and Play Analysis, Oil and Gas Production Activities, Potential for Resource Occurrence and Development, and Leasing was needed to understand the oil and gas potential. This information was used to project activity through 2018. Given the current incipient nature of petroleum development in Oregon (current Coalbed Natural Gas (CBNG) development, new exploration of the Mist Gas Field) in 2007, completely new assumptions and information that impact many Reasonably Foreseeable Development scenarios may be available during the course of the next 10 years, or, at the least, effecting projections beyond the next 10 years.

Identified potential petroleum source sedimentary basins within the District include the Astoria Basin, the Nehalem Basin (or Arch), the Tualatin Basin, the Willamette Valley, the Yaquina Basin and the Tillamook Basin. Both the Yaquina Basin and the Tillamook Basin are part of the off-shore Newport Basin. BLM manages approximately 19,400 acres of surface estate within these identified basins. The amount of subsurface estate is unknown. These basins exist within the Western Tertiary Basins Province. The Mist Gas Field lies within the Nehalem Basin/Arch.

As of 1985, the estimated in-place gas reserves for the Mist Gas Field were 28.4 billion cubic feet (bcf), with total production through 1984 being 19.2 bcf. This is a total estimated resource in 1985 of 47.6 bcf. As of 2007, DOGAMI reported that approximately 65 bcf of gas had been produced from the Mist Gas Field, with 2.7 bcf produced between 2002 and 2006. This exceeds the 1985 estimate by 17.4 bcf, indicating continued discoveries of resource.

Current non-federal lease holdings within the District are focused within the Mist Gas Field. There are currently no BLM-managed surface holdings within the Mist Gas Field. However, there appears to be one BLM-managed subsurface estate within the gas field. BLM-managed surface estate is located to the southeast of the current field description. Previous Mist Gas Field boundaries include approximately 980 acres of BLM-managed surface estate. Similar geology and structure exists under at least 9,000 acres of BLM-managed surface estate southeast of the Mist Gas Field indicating that foreseeable development expansion of the identified High Potential area could result in approximately 10,800 acres of BLM-managed lease offerings.

The spacing plan for the Mist Gas Field is 160 acres, to access reservoir pools. The size of the pools ranges from 40 acres to 160 acres. Extension of the Mist Field onto the adjacent BLM land as defined by wells and mapped geology, could result in approximately 68 wells on BLM-managed estate. Additional conventional and non-conventional development may occur within other sedimentary basins located within the district. CBNG development is occurring within Coos County. Exploration companies are mapping coal seams throughout Oregon for other potential areas. Coal has been historically mapped and mined throughout the District. However, CBNG development is not expected above exploration within the next 10 years.

Coos Bay District

The District is located on the western edge of Southwest Oregon and encompasses lands in Douglas, Coos, Curry, Lane and Josephine Counties. Conventional petroleum in the District has been the focus of numerous studies (Diller 1901, as found in Newton 1980); Niem and Niem 1990; and Ryu *et al* 1996) with the projection of numerous plays and petroleum structures. The District has also been the focus of numerous industry explorations and investigations. Two speculative conventional petroleum systems have been identified within the District (Ryu *et al*, 1996). One CBNG play has also been identified within the District, and is currently being developed on private and Coos County lands. It is expected that most District public domain, O & C lands and Coos Wagon Road lands will be available for leasing, subject to guiding stipulations.

Estimating how much oil and gas exploration and development will occur on federal lands managed by the Coos Bay District during the next ten years is at best difficult. Review of Oil and Gas Occurrence Potential, Oil and Gas System and Play Analysis, Leasing, and Oil and Gas Production Activities was needed to understand the oil and gas potential. This information was used to project activity through 2018. Where appropriate, the CBNG resource is discussed separately from conventional oil and gas.

The speculative conventional petroleum systems include the Umpqua-Dothan-White Tail Ridge hybrid petroleum system and the Umpqua-lower Tyee Mountain petroleum system. Both areas are contained in the southern Tyee sedimentary basin (Ryu *et al*, 1996) (Figure 317). The Umpqua-Dothan-White Tail Ridge hybrid petroleum system is located in the mid-central portion of the District and encompasses an estimated 350 square miles, approximately 26% of which is managed by the District. The District contains approximately 200 square miles of the Umpqua-lower Tyee Mountain petroleum system, located in the northern portion of the District. BLM-managed lands comprise about 20% of the area. The CBNG play is focused mainly on the Coaledo Formations of the onshore portion of the Coos Basin (Figure 318), an area of approximately 250 square miles located on the western edge of the District.

While oil and gas exploration has been historically associated with these systems (Ryu *et al*, 1996; Newton, 1980) and conventional oil and gas potential exists as identified speculative petroleum systems (Ryu *et al*, 1990), there is currently no known interest in exploration or development of these systems. There are presently no conventional production wells or Federal oil and gas leases. It is anticipated the District could issue competitive and over-the-counter leases and authorize geophysical surveys. It is also estimated that up to three exploratory wells for conventional petroleum may be drilled during the estimated life of this plan. Conventional exploration, coupled with CBNG exploration within coal seams beyond the Coos Basin, could potentially increase the number of wells actually drilled.

Current non-federal lease holdings within the District are focused within the Coos Basin area, with the intention of CBNG development. Approximately 115,000 of the 160,000 acres within the Coos Basin are privately held. Federally-managed mineral estate represents approximately 12.3 percent of the basin, with BLM-managed mineral estate representing roughly 7.6 percent.

Figure 317. Southern Tyee sedimentary basin, from Ryu *et al.* (1996)

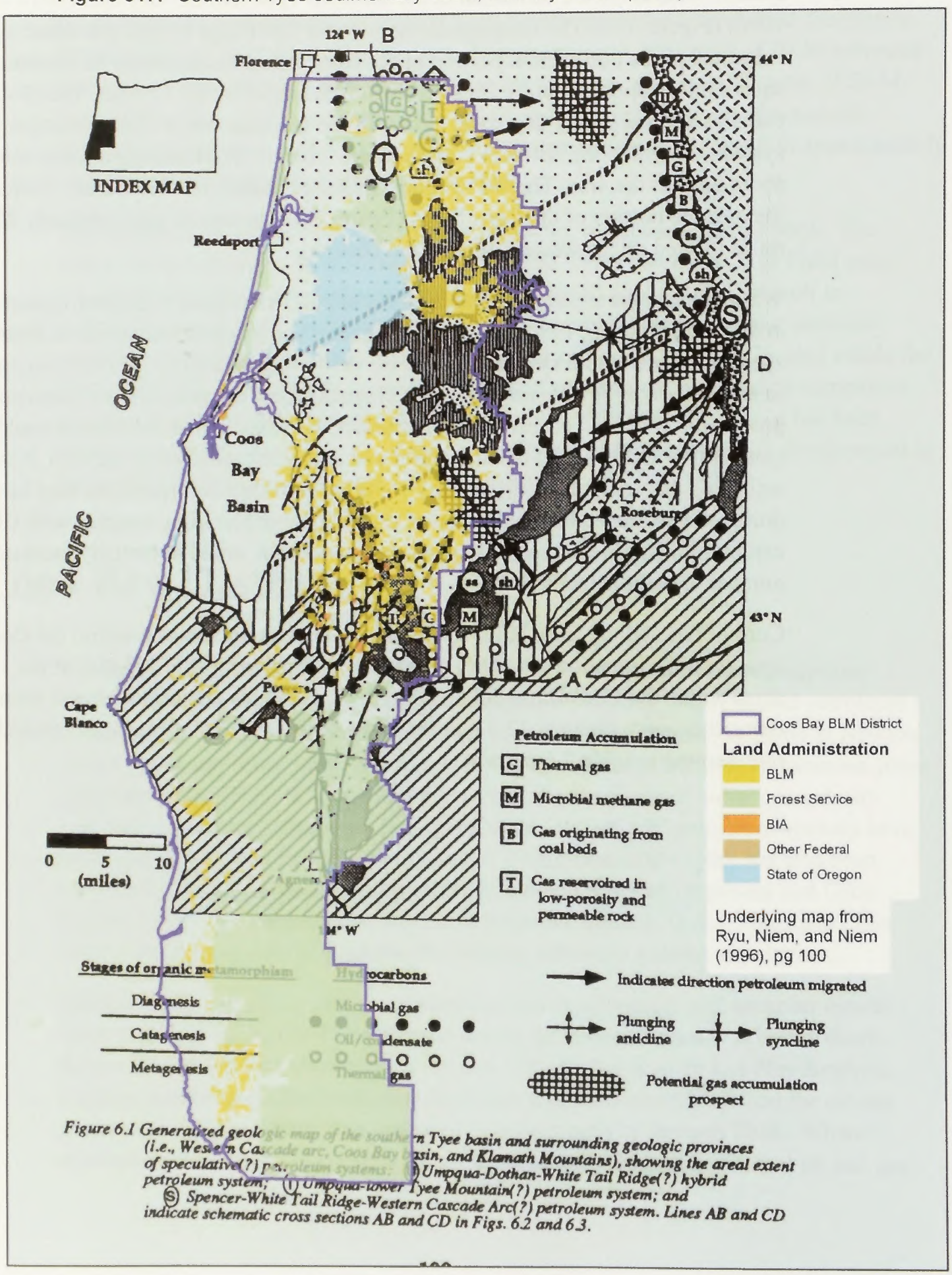
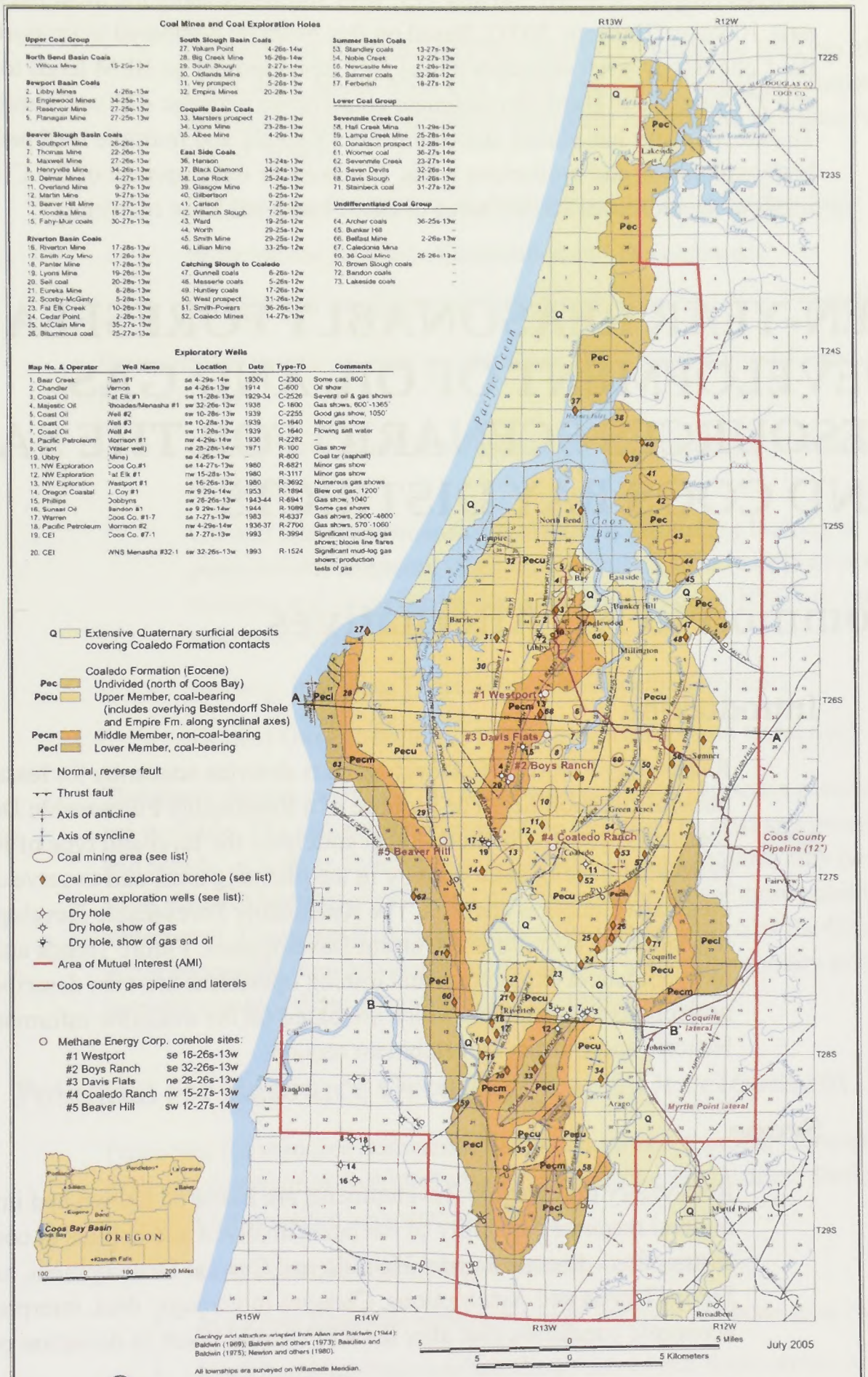


Figure 6.1 Generalized geol[ogic map of the south]ern Tyee basin and surrounding geologic provinces (i.e., Weste[rn Ca]scade arc, Coos Bay b[asin, and Klamath Mountains), showing the areal extent] of speculative(?) pe[troleum systems: (T) Umpqua-Dothan-White Tail Ridge(?) hybrid petroleum system; (U) Umpqua-lower Tyee Mountain(?) petroleum system; and (S) Spencer-White Tail Ridge-Western Cascade Arc(?) petroleum system. Lines AB and CD indicate schematic cross sections AB and CD in Figs. 6.2 and 6.3.

Figure 318. Coaledo Formations of the onshore portion of the Coos Basin, from Torrent Energy Inc. (2005)



Industry has estimated an in-place gas reserve for their lease holdings at 1,166 billion cubic feet (bcf) (1.2 trillion cubic feet (tcf)) for the privately held 115,000 acres (Sproule, 2006). To develop this resource on the 115,000 acres, Industry estimates a total build out of wells ranging between 300 and 719, with 300 wells being the most likely within the next 10 years (Halferty, 2007). Based on this estimate compared to proportional acreage, the Coos Bay District estimates a total well development on BLM lands to be between 37 and 77. Total Coos Basin development could range between 436 wells and 1,001 wells. To date, industry has placed approximately 18 single and multiple well pads consisting of both exploration and production wells. Foreseeable development of the CBNG play could result in an additional 25,000 acres of BLM-managed lease offerings.

TEN-YEAR REASONABLY FORESEEABLE DEVELOPMENT OF OIL AND GAS RESOURCES SCENARIO FOR THE SALEM AND COOS BAY DISTRICTS

Common to All Alternatives

Introduction

Reasonably Foreseeable Developments describe scenarios for leasable oil and gas mineral commodities. The purpose of a Reasonably Foreseeable Development scenario is to provide models that anticipate the level and type of future petroleum development activity in the planning area, and to serve as a basis for cumulative impacts analysis. The Reasonably Foreseeable Development first describes the Historic and Current Development. Future Trends and Assumptions of hypothetical exploration and mining operations are then described. These projections are estimates which are based on the available information within the Historic and Current Development section.

Scope

Reasonably Foreseeable Developments are based on known and inferred mineral resource capability of the lands involved and applies to conditions and assumptions discussed under Historic and Current Development, as well as Future Trends and Assumptions. Changes in geologic data, interpretation, and/or economic conditions that alter the RFD would result in deviation over time.

Impacts caused by oil and gas development, and impacts to oil and gas development, cannot be assessed without estimating future oil and gas activity.

Estimates of future activity on the Salem District would need to take into account:

- Oil and Gas Occurrence Potential, as documented by historic research and papers;
- Oil and Gas System and Play Analysis (including looking at existing plays such as the Mist Gas Field and the potential development of new plays such as identified sediment basins and Coalbed Natural Gas (CBNG);
- Oil and Gas Production, including economics and technology;
- Potential for Resource Occurrence and Development;
- Leasing and development, including Federal and Non-Federal activities.

Estimates of future activity on the Coos Bay District would need to take into account:

- Oil and Gas Occurrence Potential, as documented by historic research and papers;
- Oil and Gas System and Play Analysis (including looking at the potential development of new plays such as the identified petroleum systems and Coos Basin Coalbed Natural Gas (CBNG) or interest in unknown discoveries;
- Leasing, including Federal and Non-Federal activities;
- Oil and Gas Production, including economics and technology.

The above factors cannot be predicted with certainty, but some generalizations are possible. The estimates presented here are based on past and present activities and trends, as well as future price deviations. Those estimates may be lower than what actually happens if price and play developments are more positive than anticipated. Likewise, if exploration in existing plays, such as the Coos Basin, is not successful, new plays are not developed, and/or commodity prices are less than anticipated, these estimates may be exaggerated.

Potential for Resource Occurrence and Development

Potentials for resource occurrence and resource development (Haerter 2007-personal communications) have been estimated for the District. Definitions for potential for resource occurrence include:

- Low Potential-hydrocarbon occurrence is unlikely;
- Moderate Potential-conditions exist for hydrocarbons to occur; and
- High Potential-hydrocarbon shows have been documented or production has been established.

Definitions for potential for resource development include:

- Low Potential-economic or other conditions would likely preclude development;
- Moderate Potential-it is reasonable to conclude that development could occur; and
- High Potential-development is likely to occur within the life of the plan.

Leasing

After initial field work, research, and subsurface mapping, which may include seismic testing and data collection, leasing is often the next step in oil and gas development. Leasing may be based on speculation, with the riskiest leases usually purchased for the lowest prices.

Geophysical Exploration

Geophysical exploration is conducted in an attempt to determine the subsurface structure of an area. The three geophysical survey techniques generally used to define subsurface characteristics are measurements of the gravitational field, magnetic field, and seismic reflections.

Gravity and magnetic field surveys involve small portable measuring units which are easily transported via light-weight off-highway vehicles, such as four-wheel drive vehicles, or aircraft. Both off-highway and on-highway travel may be necessary in these two types of surveys. Usually a three-man crew transported by one or two vehicles is required. These two survey methods can make measurements along defined lines, but it is more common to use a grid with discrete measurement stations.

Seismic reflection surveys, which are the most common of the geophysical methods, produce the most detailed subsurface information. Seismic surveys are accomplished by sending shock waves, generally by a small explosion or mechanically beating of the ground surface, through the earth's surface, reflecting off some layers, thus depicting the underlying structure of the rock. The thumper and vibrator methods pound or vibrate the ground surface to create a shock wave. Usually four large trucks are used, each equipped with pads about four-feet square. The pads are lowered to the ground, and the vibrators are electronically triggered from the recording truck. Once information is recorded the trucks move forward a short distance and the process is repeated. Less than 50 square feet of surface area is required to operate the equipment at each recording site.

The small explosive method requires that charges be detonated on the surface or in a drill hole. Holes for the charges are drilled utilizing truck-mounted portable drills to create small-diameter (two or six-inch) holes to depths of 100 to 200 feet. Generally 4 to 12 holes are drilled per mile of line and a 5 to 50-pound

charge of explosives is placed in the hole, covered, and detonated. The created shock wave is recorded by geophones placed in a linear fashion on the surface. In rugged terrain, a portable drill carried by helicopter can sometimes be used. A typical drilling seismic operation may utilize 10 to 15 men operating five to seven trucks. Under normal conditions, three to five miles of line can be surveyed daily using this method. A drilling program may include the use of heavy truck-mounted drill rigs, track-mounted air rigs, water trucks, a computer recording truck, and several light pickups to transport people conducting the survey.

Public and private roads and trails are used where possible. However, off-highway cross-country travel is also necessary in some cases. Graders and dozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line, usually resulting in a well-defined two-track trail. Drilling water, when needed, is usually obtained from private landowners, but may be acquired from sources used for fire suppression, such as pump chances and ponds.

The surface charge method utilizes charges of between one and five pounds attached to wooden laths three to eight feet above the ground. Placing the charges lower than six feet usually results in the destruction of the vegetation, while placing the charges higher, or on the surface of deep snow, results in little visible surface disturbance.

Advanced Three Dimensional Survey analyzes five to six miles using lines with 1,700 shot holes at 70-foot spacing. The lines are spaced at 400 feet apart. The lines are hand brushed for survey. The survey crews utilize an Inertial Survey System that allows for accurate surveying without the need to maintain a line of sight. This allows flexibility in brushing paths. The shot hole pad is three feet by four feet in size and cleared to mineral soil with hand tools. The drill rig is then placed on the pad. If existing access to the pad is limited, the drill rig may be placed and removed by helicopter. The holes are drilled to 15-foot depths and the charges exploded subsurface, leaving no surface expression. Where there is surface expression, the damaged is mitigated with hand tools. In open valleys and areas with access, thumper rigs are used, as they disturb even less ground.

Drilling and Production Phase

Notices of Staking are anticipated during the plan period. It is anticipated that the company would then submit an Application for Permit to Drill after the Notice of Staking is accepted. Private surface owner input, if split estates are involved, would be actively solicited during this stage. Once an Application for Permit to Drill is approved, the operator initiates construction activities in accordance with stipulations and Conditions of Approval. Access road lengths vary, but usually the shortest feasible route is selected to reduce the haul distance and construction costs. In some cases, environmental factors or landowner's wishes may dictate a longer route. Drilling activity in the planning area is predicted to be done using

existing roads and constructing short roads to access each drill site location. The District will utilize currently developed and utilized forest management Best Management Practices (BMP), in addition to the BLM's "Gold Book" (USDI/ USDA 2006), for surface disturbance in road construction and pad development similar to landings.

Surface Impacts of Drilling and Production

During the first drilling phase, the operator would move construction equipment over existing maintained roads to the point where the new access road begins.

In the second part of the drilling phase, the operator would construct the drilling pad or platform, anticipated to involve approximately two acres per well site. Support facilities are anticipated to disturb about two acres per well site. The likely duration of well development, testing, and abandonment is predicted to be approximately six months to one year for each drill site.

Plugging and Abandonment

Wells that are completed as dry holes are plugged according to a plan designed specifically for the down-hole conditions of each well. Plugging is accomplished by placing cement plugs at strategic locations from the bottom of the well to the surface. Drilling mud is used as a spacer between plugs to prevent communication between fluid-bearing zones. The casing is cut off at least three feet below ground level and capped by welding a steel plate on the casing stub. Wells will be plugged and abandoned at the end of their production life, with the pad, support facilities, and road reclaimed.

Surface Impacts of Plugging and Abandonment

After plugging, all equipment and debris would be removed and the drill site would be restored as near as reasonably possible to its original condition. If new roads constructed for drilling are not needed for future access to the area, they would be reclaimed using Best Management Practices, with the road prism revegetated as required by the Authorized Officer. Pipelines will be plugged and abandoned in place to minimize new surface disturbance.

District Specific

Historic and Current Development

Oil and Gas Occurrence Potential

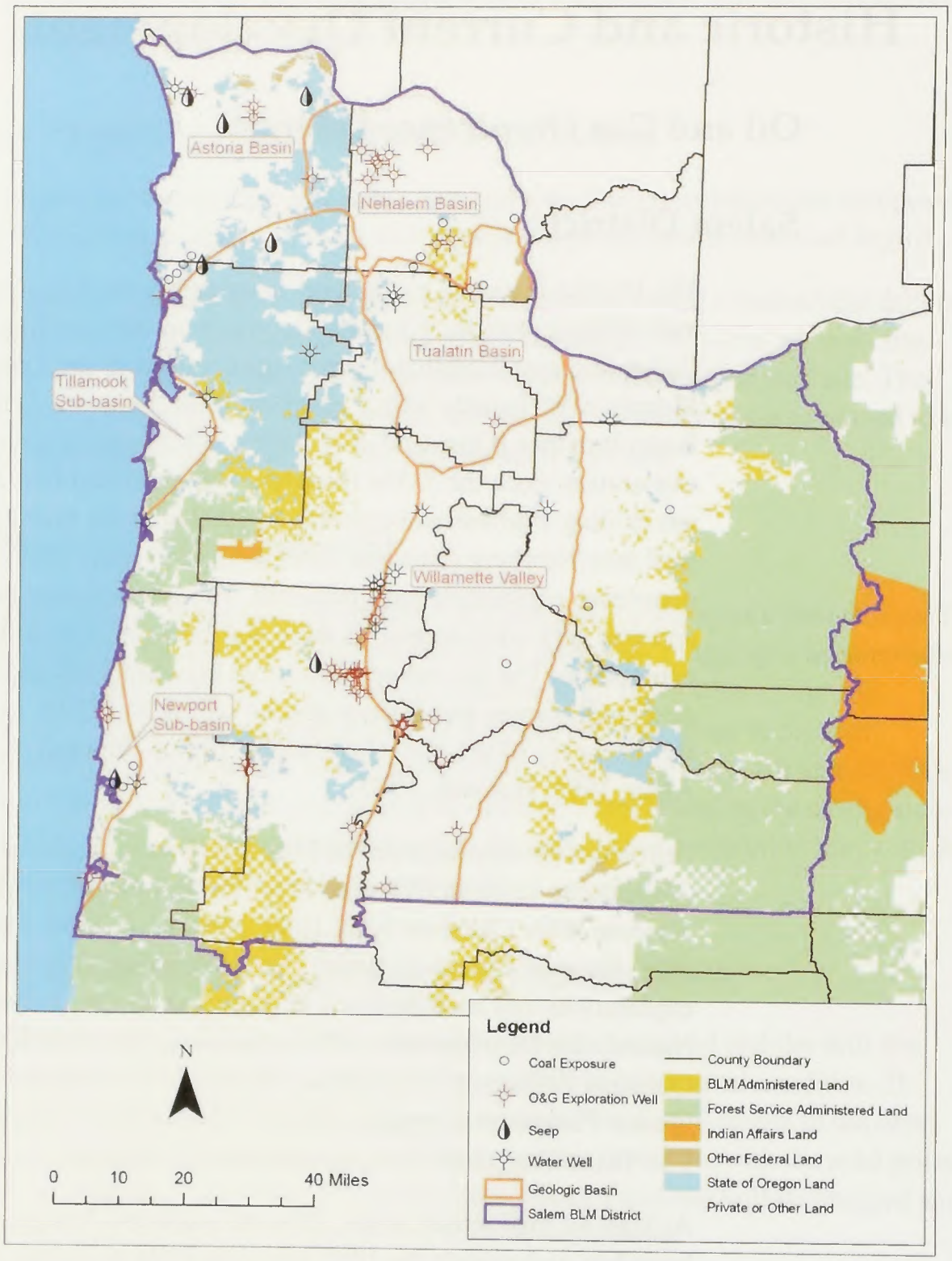
Salem District

The District is part of a structural sedimentary basin system that extends onshore and offshore from the Klamath Terrains boundary north to the Columbia River (extending into Washington) from the continental shelf east to the Cascade Mountain/Willamette Valley interface. This is known as the Western Tertiary Basin Province (Olmstead *et al.* 1989). It has been of interest for petroleum exploration since the 1880s (Newton, 1969; Orr and Orr, 2000) with oil and gas drilling exploration beginning in 1902 with the drilling of an exploration well near Newberg (Newton, 1965, Olmstead *et al*, 1989). Two major peaks of petroleum exploration have occurred. The first occurred between 1920 and 1940 and was very wide-spread, as there was little geologic information guiding the exploration. The second peak occurred between 1940 and 1960, investigating the deeper Oligocene and Eocene marine sediments. These explorations cumulated in the discovery of the Mist Gas Field in 1979 (Olmstead *et al*, 1989; Olmstead and Alger, 1985; Houston, 1997).

Petroleum development on the District has been the focus of numerous studies (Washburne 1914, in Olmstead *et al.* 1989; Stewart 1954 in Newton *et al.* 1965); Newton 1969; Olmstead *et al.* 1989; Niem *et al.* 1990; Houston 1997; and Meyer 2007 Personal Communication). The District has also been the focus of industry explorations and investigations by companies such as Northwest Natural (Oregon Natural Gas Development), RH Exploration, Diamond Shamrock Corporation, Quintana Petroleum Corporation, Standard Oil Company of California, American Quasar Petroleum Company, ARCO Oil and Gas Company, Exxon Corporation, The Texas Company (Texaco), and others (Olmstead *et al*, 1989).

At least 42 exploration wells, 16 water wells and 7 seeps within the District boundary and outside the 1985 Mist Gas Field boundary (Figure 319) have had gas shows (Olmstead *et al.* 1989). As of 1989, a total of at least 108 wells drilled outside of Columbia County (which holds the Mist Gas Field) and within the District (Olmstead *et al.* 1989), have defined specific sedimentary basins of the Western Tertiary Basin Province that exist within the District (Newton, 1969; Olmstead *et al.* 1989). These basins have been the focus of historic investigation and contain potential conventional petroleum development (Newton, 1969; Niem *et al.* 1985; Meyer, 2007-personal communications).

Figure 319. BLM Oregon Salem District, Surface. Based on Newton (1969), Ferns and Huber (1984), Olmstead ***et al.*** (1989), and BLM (2007)



Non-conventional systems such as CBNG may be a possibility and is being researched where coal is present (Wiley 2006-personal communications; Pappajohn 2007-personal communications; Meyer 2007-personal communications).

Coos Bay District

The District is part of a structural sedimentary basin system that extends onshore and offshore from the Klamath Terrains boundary (Middle Fork of the Coquille River) north to the Columbia River (extending into Washington), from the continental shelf east to the Willamette Valley. These basins have been the focus of petroleum exploration since the 1880s (Newton, 1980; Orr and Orr, 2000), with oil and gas drilling exploration of the District beginning in 1913 (Newton, 1980). Conventional petroleum in the District has been the focus of numerous studies (Diller 1901, in Newton; Niem and Niem 1990; Ryu *et al.*1996) with the projection of numerous plays and petroleum structures. The District has also been the focus of industry explorations and investigations by companies such as AMOCO Production Company, Union Oil Company, Phillips Petroleum Company, Northwest Natural Gas Company (Newton 1980) and Methane Energy Corporation (Pappajohn 2002).

The most recent play and petroleum structure projections provide three possibilities within the District. These include portions of two potential conventional petroleum structures (Ryu *et al.* 1996) and a non-conventional CBNG play identified by Methane Energy Corporation (Pappajohn, 2002).

Oil and Gas Structures and Plays

A speculative petroleum system presumes a direct relationship between a particular source rock and a resulting potential petroleum (or natural gas) accumulation (Ryu *et al*, 1996). An oil and/or gas play is an area, geologic formation, or geologic trend which has good potential for oil and/or gas development, **or** is generating a large amount of interest in leasing and drilling (BLM, 2001).

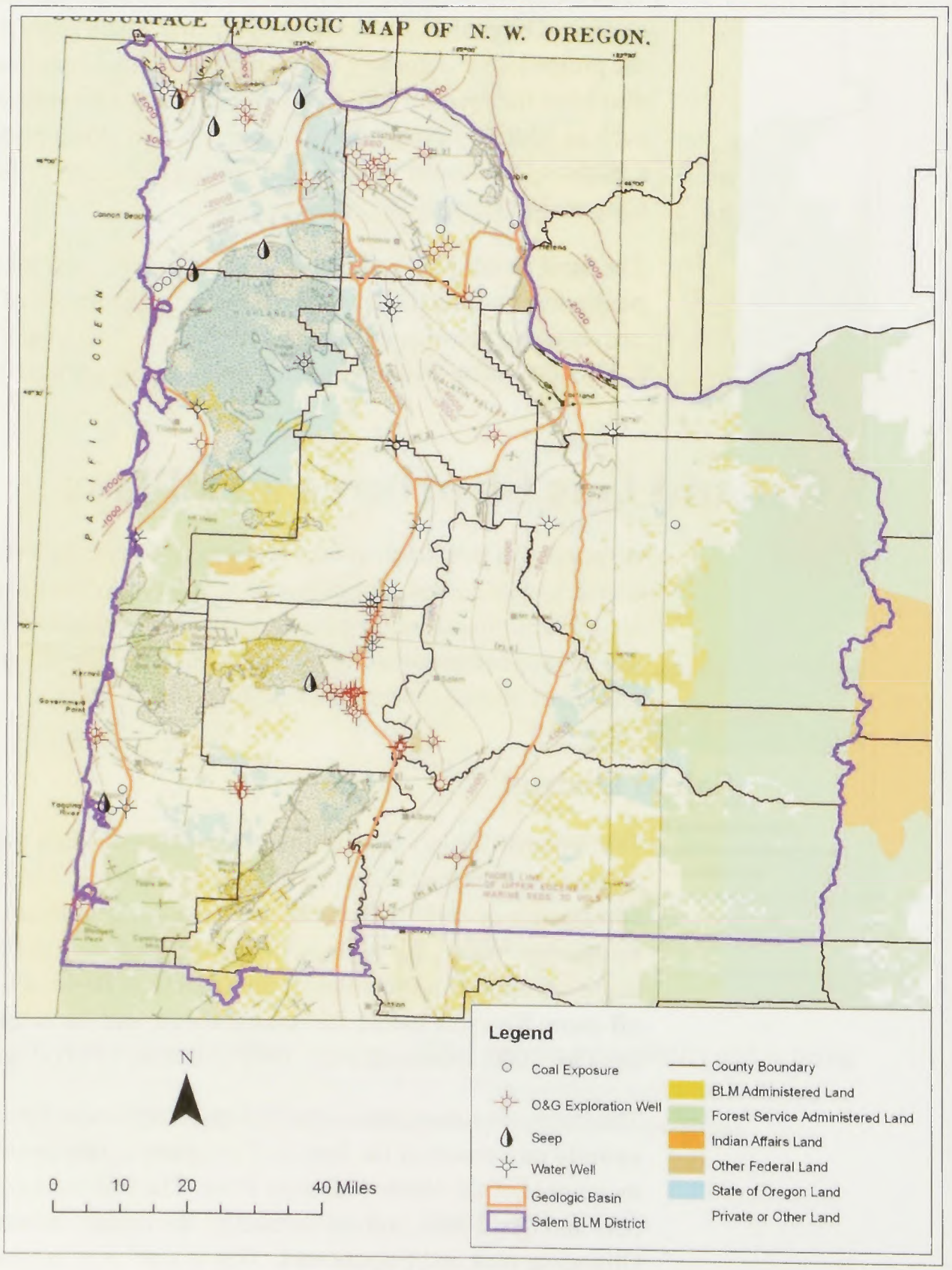
Salem District

The Western Tertiary Basin Province contained within the District possesses at least six identified basins or sub-basins (Newton, 1969; Orr and Orr, 2000; Olmstead *et al.* 1989). These include: the Tualatin Basin ,a sub-basin of the Willamette Valley; the Willamette Valley; the Newport Basin, a sub-basin of the larger off-shore Newport Basin; the Tillamook Basin, a sub-basin of the larger off-shore Newport Basin; the Astoria Basin; and the Nehalem Basin or arch (Orr and Orr, 2000; Olmstead *et al*, 1989; Newton, 1969) (Figures 319 and 320).

The basins structures are controlled by compression force of the sub-ducting easterly movement of the Juan de Fuca plate in relation to the overriding westerly movement of the North American Plate. The fold axes are oriented north-south (Orr and Orr, 2000), and are defined by the contact between the Miocene or Oligocene rock and Eocene rock. This is a point of erosion of the Eocene rock, which was covered by Miocene or Oligocene rock, defined as a nonconformity

(unconformity if covered by Miocene or Oligocene sedimentary rock). This break in the geologic column is considered the Eocene nonconformity and a focus of petroleum exploration. The Eocene rocks consist of marine sediments, with latter sedimentation creating coal beds in many areas (Newton, 1969) (Figure 320). The District manages a total of approximately 19,375 acres of surface estate within these basins (BLM, 2007).

Figure 320. Salem District BLM, Subsurface. Based on Newton (1969), Ferns and Huber (1984), Olmstead *et al* (1989), and BLM (2007)



Tualatin Sub-Basin: The BLM manages approximately 8,858 acres of surface estate in the Tualatin Sub-Basin (BLM, 2007) which is considered part of the Willamette Valley. The lower rock is Eocene shale and sandstone intermixed with basalt. Miocene Columbia River Basalts rest unconformably on top of the sedimentary rock and are covered by gravels and silts. The Eocene rock and sands have excellent reservoir characteristics as the faulting and overlying basalts provides trap structures (Newton, 1969). The Eocene Nonconformity is at a maximum mapped depth of 4,000 feet below sea level (Newton, 1969) (Figure 318). It is thought that the Tualatin Sub-Basin is a source of petroleum for the Mist Gas Field (Olmstead and Alger, 1985; Houston, 1997).

Willamette Valley: The BLM manages approximately 644 acres of surface estate in the Willamette Valley, excluding the Tualatin Sub-Basin (BLM, 2007). The lower rock, or basement rock, is the Eocene Siletz River Volcanics or Kings Valley Siltstone. Overlying these are sandstones and siltstones of the Eocene Nonconformity, then covered by volcanics, and overlain by sandstone, limestone, and coal beds. This is capped by the Columbia River Basalts and then covered by tuff and silt. The petroleum potential Eocene rock boundary is defined to the east by the change from marine sediment to volcanic sediment (facies change) (Newton, 1969) (Figure 320). Numerous wells with gas shows have been drilled within the valley. The eastern valley edge provides numerous possibilities for structural traps, with the marine beds providing source rock. Even though numerous holes have been drilled and source and structure is present, true potential has not been clearly defined. The Eocene Nonconformity (marine facies) is at maximum mapped depth mapped of 5,000 feet below sea level (Newton, 1969).

Newport Sub-Basin: The BLM manages approximately 443 acres of surface estate in the Newport Sub-Basin (BLM, 2007) which is part of the off-shore Newport Basin (Orr and Orr, 2000). As most of the basin lays off-shore, little was found to be published about on-shore portions of the specific Newport Sub-Basin. Generally, the off-shore basins consist of thicknesses up to 15,000 feet of marine sediments, predominately siltstones and shales, with some sand shows. Oil and gas shows occurred in at least three of the off-shore wells (Orr and Orr, 2000). Two exploratory gas wells with shows, one seep and one gas show in a water-well have been reported within the Newport Sub-Basin (Olmstead *et al.* 1989). There are also occurrences of coal (Ferns and Huber, 1984) (Figure 319 and 320). The Eocene Nonconformity is at a maximum on-shore mapped depth of 2,000 feet below sea level (Newton, 1969) (Figure 320).

Tillamook Sub-Basin: The BLM manages approximately 25 acres of surface estate within the Tillamook Sub-Basin (BLM, 2007) which is also a part of the off-shore Newport Basin (Orr and Orr, 2000), described above. Gas show has been associated with one exploratory well and two water wells in the Tillamook Sub-Basin (Olmstead *et al.* 1989). The Eocene Nonconformity is at a maximum on-shore mapped depth of 2,000 feet below sea level (Newton, 1969) (Figure 320).

Astoria Basin: The BLM manages approximately 39 acres of surface estate within the Astoria Basin (BLM, 2007). The lowest sequence of rock, considered the basement rock, is the upper Eocene Volcanics. There are a few thin beds of sandstone and mudstone that are inter-fingered with the Tillamook Volcanics. A few of these sedimentary layers have gas shows. The volcanics are overlain with the mudstone-dominated rock, with sandstone and conglomerate members. The mudstone is overlain by sandstone and siltstones. These sandstones, the Cowlitz Formation, contain the Clark and Wilson Sandstone which is the gas reservoir in the Mist Gas Field. Late Eocene mudstone and sandstone sequences then overlie the Clark and Wilson Sandstones (Niem *et al.* 1985; Houston, 1997). A total of 49 noncommercial gas shows were recorded in eight wells developed within the basin. Gas shows, with the majority of hydrocarbon chains being methane, were recorded in all units except the Roy Creek conglomerate and sandstone, the Pittsburg Bluff Formation and the Wickiup Mountain and Youngs Bay members of the Astoria Formation (Niem *et al.* 1985). The Eocene Nonconformity is at a maximum mapped depth of 5,000 feet below sea level (Newton 1969) (Figure 320). It is thought that the Astoria Basin is a source of petroleum for the Mist Gas Field (Olmstead and Alger, 1985).

Nehalem Basin: The BLM manages approximately 9,366 acres of surface estate in the Nehalem Basin (BLM, 2007). It is in this basin that the Mist Gas Field exists (Figure 321) the only official State of Oregon Designated Gas Field. This basin that has the most potential for further gas development that may impact BLM-managed lands (Houston 1997; Houston 2007-personal communications; Meyer 2007-personal communications). While the Nehalem structure is defined as a Tertiary Basin by most researchers (Olmstead *et al.* 1989; Olmstead and Alger 1985; Newton 1969; Houston 1997), it has also been identified as an arch in comparison to the surrounding structures of the Astoria Basin to the west and the Tualatin Sub-Basin to the east (Armentrout and Suek in Niem *et al.* 1985; Orr and Orr 2000). The description of the structure as an arch provides mechanism for petroleum migration from the adjoining Astoria Basin and Tualatin Sub-Basin to the collection traps of the Nehalem Arch (Niem *et al.* 1985). However, the structure does have a down-warp, creating a closed structural basin (Newton 1969) (Figure 320). A great deal of geologic work has occurred within the Mist Gas Field and surrounding areas of the Nehalem Basin (Niem *et al.* 1985 and 1990; Olmstead *et al.* 1985), including Three Dimensional Survey (Meyer 2007-personal communication). Specific geologic interpretation was conducted on the Bacona Quadrangle containing BLM-managed lands located ten miles southeast of the Mist Gas Field (Houston, 1997) (Figure 320).

The Nehalem Basin consists of deltaic to shallow-marine and deep marine depositional environments, depositing thousands of feet of mud and sand. There was also intermittent volcanism (Houston 1997; Olmstead and Alger 1985). This lithified material creates the basin's stratigraphy. The oldest rock, considered the economic basement rock, is the Middle to Upper Eocene Tillamook Basalts. However, other localities show that deep-water depositions of the Yamhill

Formation may underlie the Tillamook Basalts (Olmstead and Alger 1985). Houston (1997) has defined, at least in part, the Yamhill Formation as the Hamlet Formation. The mudstone of the Hamlet Formation is mature at depth and could be a source of petroleum within the Mist Gas Field. It is overlain by the Cowlitz Formation, separated by unconformity (Houston 1997; Olmstead and Alger 1985). The lowest member of the Cowlitz Formation is the Clark and Wilson Sandstone that serves as the major reservoir rock for the Mist Gas Field (Olmstead and Alger, 1985) and reservoir potential outside the Mist Gas Field (Houston 1997). Coal also occurs within the sandstone (Olmstead and Alger 1985). The sandstone in the Mist Gas Field has flow rates of 10,000 to 20,000 cubic feet per day (Niem *et al.* 1985 *in* Houston 1997). However, the reservoir quality deteriorates southeast of the Mist Gas Field (Houston, 1997) and BTU rates may also decline southeast of the Mist Gas Field (Meyer 2007-personal communications).

Overlying Clark and Wilson Sandstone is a mudstone member of the Cowlitz Formation. This formation is a deep oceanic mudstone that acts as a seal to the Clark and Wilson Sandstone, helping form the petroleum trap (Houston, 1997). After deposition of the Cowlitz Formation, the region was faulted, creating horst and graben environment, possibly forming structural traps. These fault patterns are not transferred to the younger overlying formations and, therefore, more recent faulting may not have compromised these traps. The faults truncate at the Keasey Formation-Goble Volcanics (Houston, 1997; Houston, 2007-personal communications; Olmstead and Alger, 1985).

Covering at least a portion of the Cowlitz Formation, and intermixed with the Keasey Formation, is the Goble Volcanics, shown as a 2,000 meter thick sequence in the exploration hole located on BLM-managed lands (Figure 322). The Keasey Formation unconformably overlies the Cowlitz Formation where the Goble Volcanics are not present, and consists of silty mudstone (Houston 1997). It is in turn covered by the sandstones, mudstones, siltstones, and volcanics of the Oligocene Pittsburg Bluff Formation (Houston 1997; Olmstead and Alger 1985). Coal seams are also found in the Pittsburg Bluff Formation (Houston 1997). The Scappoose Formation unconformably overlies the sandstone Pittsburg Bluff Formation (Houston 1997) with flows from the Miocene Columbia River Basalts as an unconformable cap rock. The Eocene Nonconformity is at a maximum mapped depth of 500 feet below sea level (Newton, 1969) (Figure 320).

Figure 321. Mist Gas Field, 1999 Boundary (DOGAMI 2003)

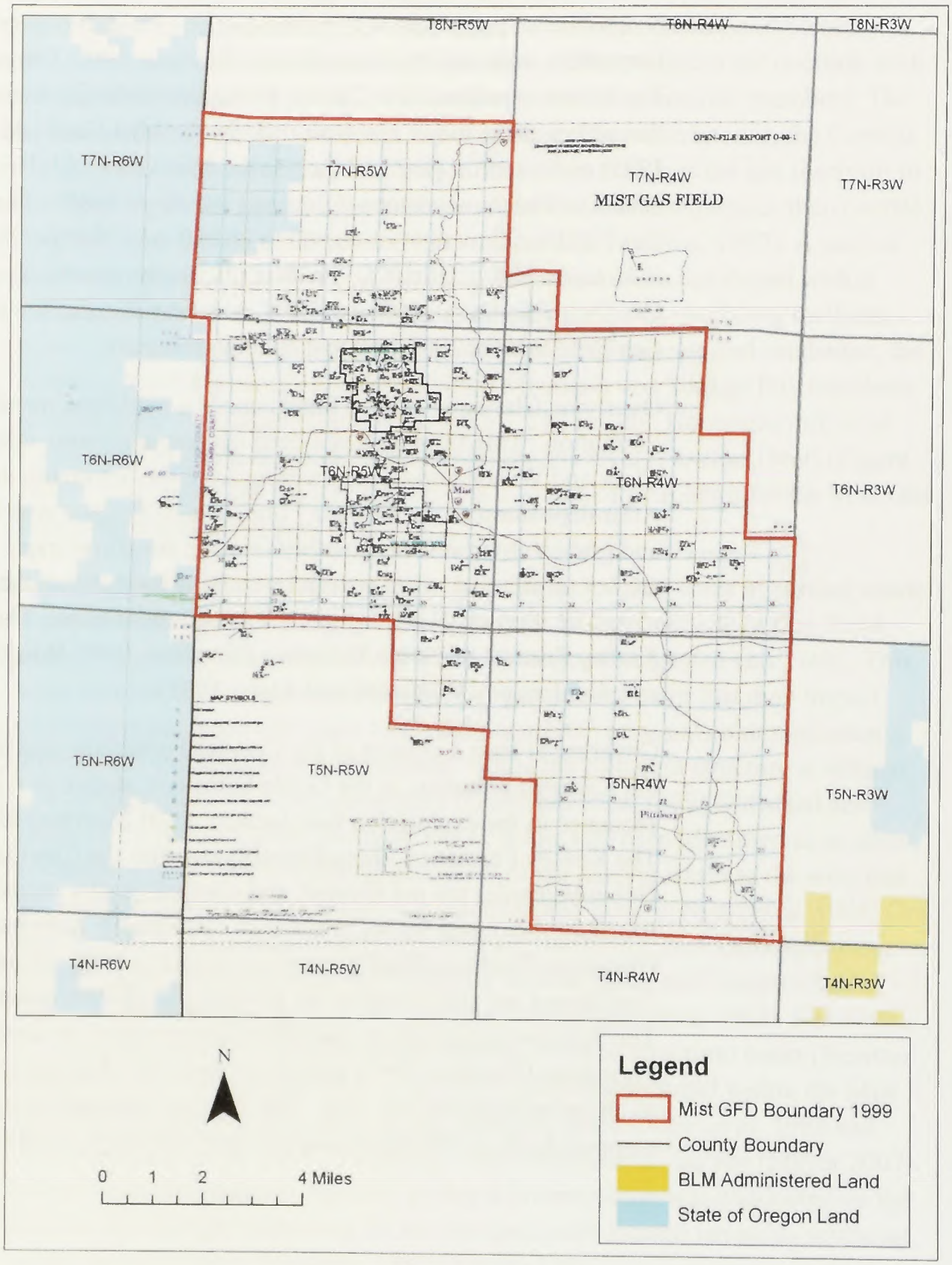
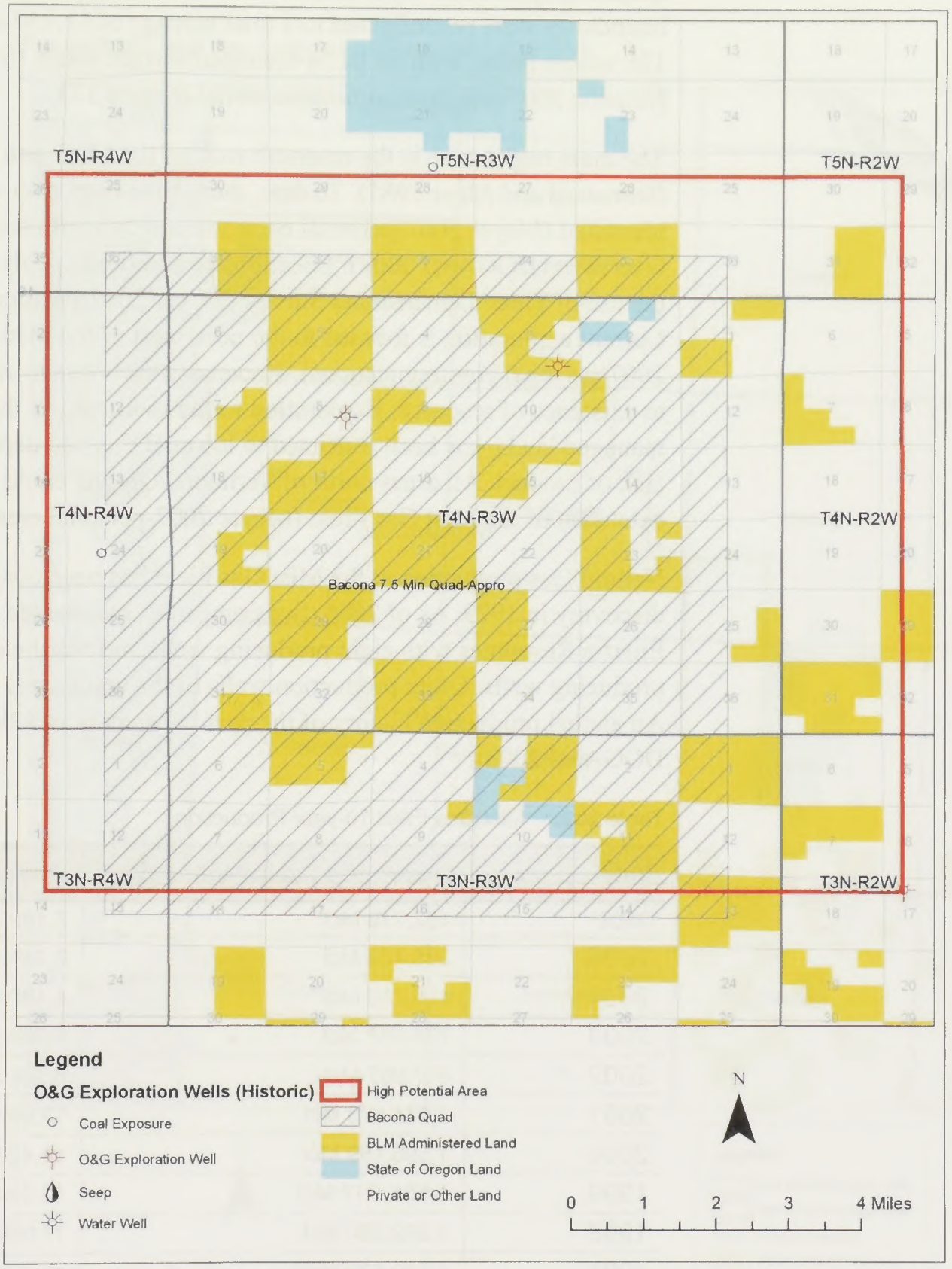


Figure 322. Identified High Potential Area (this report) and Bacona Geologic Quadrangle (Houston 1997)



The Mist Gas Field Designation was initiated with the discovery of natural gas in 1979. The official boundaries as of 1985 consisted of 89,575 acres, approximately 140 square miles (State of Oregon 1985; Olmstead *et al.* 1985), including approximately 978 acres of BLM-managed surface estate. By 1999, the boundaries were reconfigured to a total acreage of 81,850 acres, approximately 128 square miles, with no BLM-managed surface estate (State of Oregon 1999; Houston 2007-personal communications) (Figure 323).

The main target zone is the reservoir rock of the Clark and Wilson Sandstone (Olmstead and Alger 1985). To date, there have been over 45 separate pools identified (Meyer 2007-personal communications) with two gas storage reservoirs (DOGAMI 2003). Locations of additional pools are expected with the use of Three Dimensional Survey (Meyer 2007-personal communications). Current exploration is focused to the northwest of the Mist Gas Field (Houston 2007-personal communications). However, this is due to economics as opposed to existence of resource. Exploration to the southeast, in the direction of BLM-managed lands, has been restricted to lower BTUs and depth of resource, not lack of product. All areas north of Vernonia, Oregon could be considered a viable extension of the Mist Gas Field (Meyer 2007-personal communications).

Natural Gas production at the Mist Gas Field has been consistent since its discovery in 1979. As of 2006, two companies maintained production wells, Enerfin Resources with eight producing wells and Northwest Natural with four producing wells. Other production wells of the companies were shut in for 2006. An annual production history of the past 10 years is as follows (DOGAMI 2007; DOGAMI 2003):

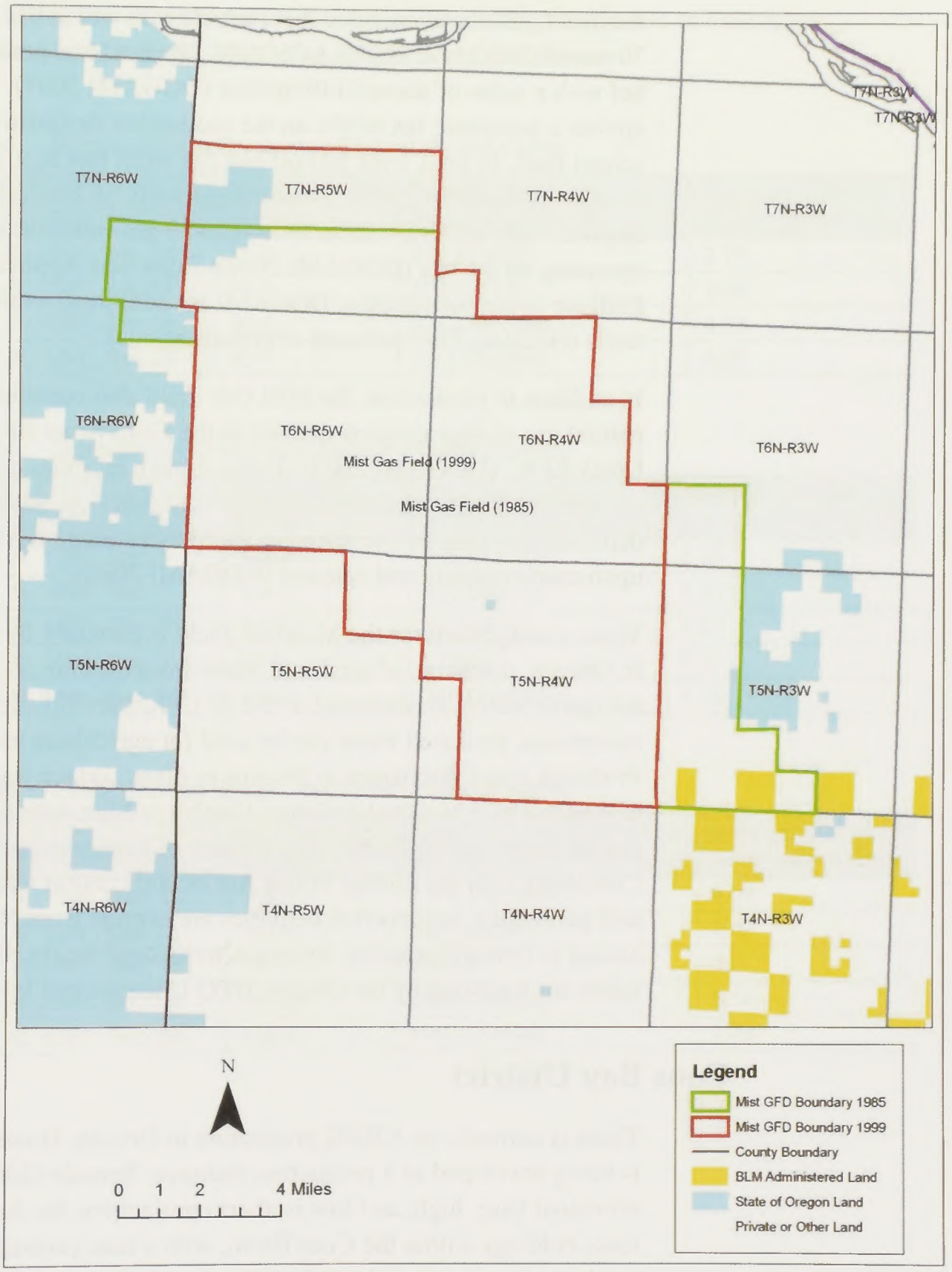
Table 292. Mist Gas Field 10-year Production

Year	Cumulative Cubic Feet-All Wells	Cumulative Therms-All Wells
2006[1]	402,713 Mcf	2,482,713
2005	305,433 Mcf	2,744,415
2004	466,756 Mcf	4,180,445
2003	733,537 Mcf	6,500,818
2002	837,067 Mcf	6,926,533
2001	2,674,673 Mcf	10,037,413
2000	1,596,159 Mcf	14,426,257
1999	1,554, 717 Mcf	13,534,088
1998	1,262,550 Mcf	11,009,121
1997	1,380,509 Mcf	12,023,109
10-Year Total:	9,659,397 Mcf (9.7 bcf)	83,864,912

[1] Update on March 20, 2007 of DOGAMI Database (DAGAMI, 2007)

Gas production has decreased from its discovery in 1979 to present (2006), depleting known pools. However, with the advancement of Three Dimensional Survey it is probable that additional pools within and outside of the Gas Field Designation Boundary will be discovered and developed.

Figure 323. Mist Gas Field Boundaries-1985 and 1999



Oil and Gas Production

Salem District

Annual production for 2005 for the Mist Gas Field was 305,000 thousand cubic feet (mcf) (305 million cubic feet (mmcf) with a total life production to date of 70 mmcf (DOGAMI 2007). As of 2006, the field had produced approximately 68 bcf with a value of about $140 million (DOGAMI 2007). The State of Oregon applies a severance tax of 6% on the production designated to the common school fund. In total, over 500 oil and gas wells had been permitted in the field by 2003 (DOGAMI 2003). There are currently 18 producing wells, one water disposal well, 21 observation wells, and 20 gas injection/withdrawal wells operating on the site (DOGAMI 2007). Eight new Applications for Permit to Drill are being submitted to DOGAMI for additional exploration and production wells (Houston 2007-personal communications).

In addition to production, the Mist Gas Field also contains two underground natural gas storage projects defined as the Flora/Bruer EFSC and the Calvin Creek EFSC (DOGAMI 2003). These storage facilities consist of six drained gas structures with a storage capacity of 12.5 bcf. As additional pools become depleted they may be converted to additional storage facilities. This is dependent upon market supply and demand (DOGAMI 2006).

Water management for the Mist Gas Field is currently by deep well injection. In Oregon, discharge of produced water from onshore oil and gas activities into navigable waters is addressed in the 40 CFR, Part 435, Subparts C and E. With exceptions, produced water can be used for agriculture and wildlife propagation. Produced water discharges to streams or other surface water bodies must be authorized by a National Pollutant Discharge Elimination System (NPDES) permit issued by the Oregon Department of Environmental Quality (DEQ). Consistent with the Energy Policy Act of 2005, storm water discharges from oil and gas-related construction activities are exempt from NPDES permit coverage, except in limited instances. Injection wells used for the disposal of produced water are regulated by the Oregon DEQ Underground Injection Control program.

Coos Bay District

There is currently no CBNG production in Oregon. However, the Coos Basin is being developed as a production resource. Sproule (2004, 2005, 2006) has estimated base, high, and low isotherm projections for the industry's 115,000 acre lease holdings within the Coos Basin, with a base (average) isotherm projected in-place gas volume of 1,166 bcf. The low isotherm projects in-place gas volume of 725 bcf, with a high isotherm projection of 1,617 bcf.

The target coal groupings are split into the Lower Coaledo, Isthmus Slough and South Slough groups. Sproule's (2005, 2006) average estimates for gas in-



place for the Lower Coaledo Group is 854 mmcf per 80 acres. Estimates for the Isthmus Slough and South Slough groups are 268 mmcf per 80 acres and 186 mmcf per 80 acres, respectively.

Site-specific calculations for volumetric in-place gas content calculated from average in-situ-isotherms were completed by Sproule (2005). Some of these estimates were conducted for sections including or adjacent to Federally-managed mineral rights. The estimates are as follows:

Table 293. Isthmus Slough Group near Federal Mineral Rights

Location	Gas Content, scf[2]/ton	Total Gas, mmcf/ Acreage sampled	Average Gas per Acre, mmcf/acre[3]
T. 27S, R. 13W., Sec. 11	71.4	828.521/300	2.76
T 27S., R. 13W., Sec 14	54.1	168.327/70	2.40
T 27S., R. 13W., Sec 15	90.4	2342.751/480	4.88
T. 27S., R. 13W., Sec 24	80.1	3115.784/640	4.87

Table 294. South Slough Group near Federal Mineral Rights.

Location	Gas Content scf/ton	Total Gas, mmcf/ Acreage sampled	Average gas per Acre, mmcf/acre
T. 26S., R. 13W., Sec. 6	148.4	665.871/308	2.16
T. 26S., R. 14W., Sec. 1	154.7	150.968/100	1.51
T. 26S., R. 14W., Sec. 3	147.6	15.254/15	1.02
T. 26S., R. 14W., Sec. 4	68.2	0.0/0.0	0.0
T. 26S., R. 14W., Sec. 28	110.6	280.005/160	1.75

Table 295. Lower Coaledo Group[1] near Federal Mineral Rights.

Location	Gas Content scf/ton	Total Gas, mmcf/Acreage sampled	Acreage gas per Acre, mmcf/acre
T. 27S., R. 13W., Sec. 11	158.4	2174.382/360.8	6.03
T. 27S., R. 13W., Sec 12	147.6	590.400/285.9	2.07
T. 27S., R. 13W., Sec. 13	146.0	0.0/0.0	0.0
T. 27S., R. 13W., Sec. 14	149.1	2981.251/580	5.14
T. 27S., R. 13W., Sec. 24	158.4	1140.074/640	1.78

[1] Most of the Lower Coaledo Isotherm Data in Sproule (2005) did not specify section location within a township. Therefore, position of Federal managed rights could not be determined in relation to the MEC cited acreage. These Townships were not included in this report, but, it should be noted, that Federal holdings may be located near Sproule's (2005) projections.

While, based on limited analysis (Sproule 2005), Federally-managed mineral rights may contain less in-place gas volume than the average of industry's holdings, in-place gas is present in measurable volumes.

The analysis of CBNG potential is limited to the Coos Basin coals to a depth of 4,244 feet. Other coal seams occur at deeper intervals, with areas in the South Slough containing coals at depths greater than 10,000 feet. These deeper seams have not been included in the analysis (Sproule 2005). Gas content in the overlying coals may also imply migration of gas from deeper thermogenic sources as well as biogenic development in the target seams (Sproule 2004).

Methane Energy Corporation is utilizing directional drilling of multiple wells from single pad locations. Engineering analysis (Sproule 2004) estimated a 160 acre well spacing on a 50,000 acre lease development. This would yield a maximum potential number of wells for 115,000 acres of development to approximately 719 wells.

Methane Energy Corporation's pilot production program includes the Radio Hill, Beaver Hill, and Westport sites located in the center of the Coos Basin. Collection systems are currently being engineered for the Westport site which will deliver production gas from the well to the Coos County Natural Gas Pipeline.

Initial results from the Radio Hill and Beaver Hill sites indicated that the CBNG was a dry gas, with little production water. This type of system is similar to Horseshoe Canyon coals of Alberta, the Hartshorne coals of the Arkoma basin, and the Fruitland coals of the south San Juan basin (Sproule 2006). However, future production of CBNG could encounter a wet gas system similar to the Powder River basin type. This could create substantial amounts of production water that will need to be managed. Initial results indicate brackish salinity in the production waters. Industry is currently reviewing injection potentials.

Examples of water management issues exist within current CBNG producing areas outside of Oregon and may be used for possible guidance of CBNG development in the District. Powder River Basin CBNG development has produced nearly four billion barrels (bbl) of water through 2006, equating to two bbl of water for every 1,000 cubic feet of gas. Operators discharge 61 percent of the water into ephemeral and perennial surface drainages, 31 percent into off-channel pits, and 5.7 percent for irrigation. Of the remainder, 1.4 percent is re-injected into the wells, and 1.2 percent is treated by ionic exchange. Only 25 percent of the shallow injection wells have been successful (Petzet 2007).

Potential for Resource Occurrence and Development

Salem District

Six distinct sedimentary basins or sub-basins have been the focus of petroleum explorations, the Eocene Unconformity being the primary target of exploration. In areas outside these basins, the target is above surface and eroded, creating the highlands. There has been little exploration of these areas, as any plays that might exist would be below the basement rock of Tillamook or Siletz River Basalts with low potential for occurrence and low potential for development. It is within these areas that the majority of the District's managed lands exist. It should be noted that private timber companies have been marketing the potential of all their lands in Oregon and Washington for the exploration and development of petroleum resources (Meyer 2007-personal communications). Exploration has demonstrated the presence of petroleum in all six basins, although commercial development has been limited to one. While the potential for resource occurrence in all six basins is Moderate to High, the potential for resource development for five of the basins would be Moderate, with little expectation for development within the ten year life span of this scenario. The basins that would have High Potential for Resource Occurrence and Moderate Potential for Resource Development include:

- The Newport Sub-Basin,
- The Tillamook Sub-Basin,
- The Astoria Basin (although, given the location of the Mist Gas field, development potential should be considered higher),
- The Tualatin Sub-Basin (as with the Astoria Basin, development potential could be higher). However, a small portion of the Tualatin Sub-Basin may be included in the identified High Potential Area described below, and
- The Willamette Basin.

The Nehalem Basin, or Arch, has been the most extensively explored structure, resulting in the development of a commercially viable gas field. The basin maintains a High Potential for Resource Occurrence and a High Potential fro Resource Development.

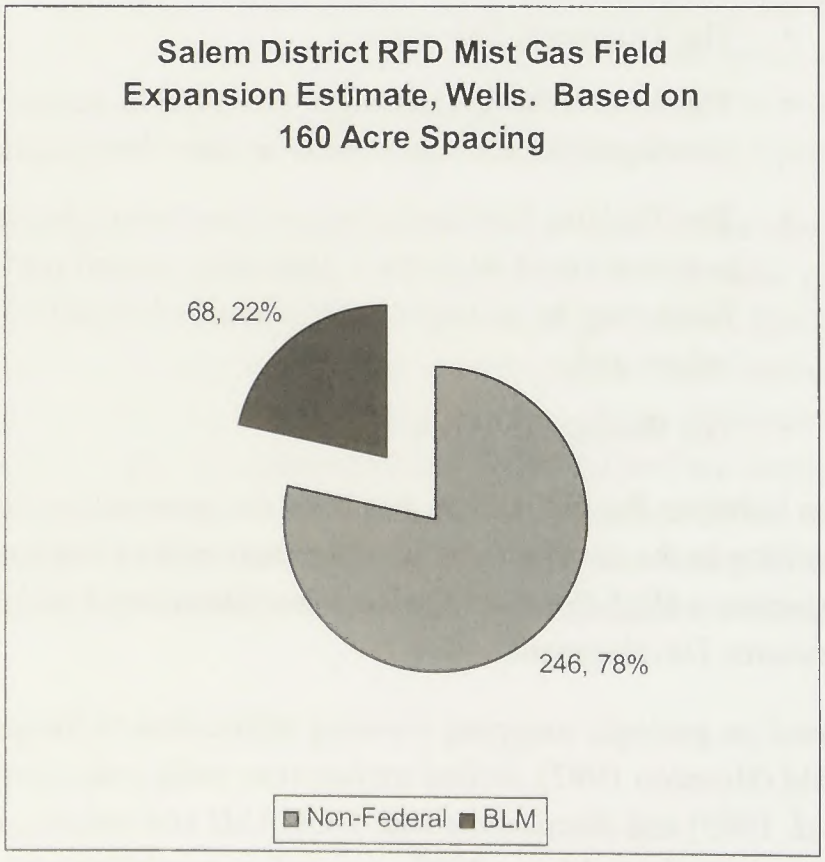
Based on geologic mapping showing similarities to the geology of the Mist Gas Field (Houston 1997), drilled exploration wells with petroleum shows (Olmstead *et al.* 1989) and discussions with DOGAMI and industry (Houston 2007-personal communications; Meyer 2007-personal communications), it is estimated that up to 50,200 acres containing both BLM-managed surface estate and non-federal estate could be explored and developed for petroleum in the 10-year life of this

scenario. Of this acreage, the District maintains approximately 10,800 acres of BLM-managed surface estate. The remaining 39,400 acres appears to be non-federal lands.

The lands are associated with the geologically mapped Bacona Quadrangle (Houston 1997), bound to the southeast by Leaseholding Syndicate's 1925-1927 exploration hole named Dutch Canyon. The well was located at the NW¼ of Section 17 in Township 3 North, Range 2 West. The well encountered gas at a depth of 1,850 feet. The pressure of the gas blew water and mud 20 feet above the casing. However, analysis of the gas determined that only 7.9% was methane while 91.8% was Nitrogen. The identified High Potential area is located southeast of the existing field (Figure 322). Additional petroleum development could likely occur to the northwest of the current Mist Gas Field, an area of current focus of exploration. However, there is no known BLM-managed estate in that area (BLM 2007).

It is assumed that if this area containing both federal and non-federal lands were developed, it would be as an extension of the current Mist Gas Field. Therefore, the current spacing plan of one well per 160 acres would likely apply (DOGAMI 2003; State of Oregon 1999), allowing for a total of approximately 314 wells within the identified High Potential Area, approximately 68 of which could be on BLM-managed surface estate. The District could foresee approximately 22 percent of the expansion development, with non-federal lands carrying approximately 78 percent of the expansion development.

Figure 324. Salem District Mist gas Field Expansion Estimate, 160 acre spacing.



Coos Bay District

Three areas within the District have been identified as having petroleum potential. The two conventional petroleum structures described by Ryu *et al.* (1996) have a moderate to high potential for occurrence. The structures have been identified and historic exploration has had both oil and gas shows. However, resource development potential is low to moderate. While hydrocarbons may exist, it has not been historically economic to produce these resources. This is due to lack of infrastructure, low price, and limited investigations.

The Coos Basin has a high potential for occurrence of CBNG. The structure has been identified and hydrocarbon shows have been documented. While actual economic production from this play has not occurred, initial steps with the placement of infrastructure and wells as well as the Gas Field Designation process has been implemented. The potential for resource development is also high. It is likely that development will occur within the life of this plan, with private development already occurring.

Leasing

Salem District

Foreseeable development of the Mist Gas Field could result in potentially an additional 10,800 acres of BLM-managed lease offerings. If these offerings were sold for the 2006 average of $17.71 per acre, the net receipts would be nearly $191,268.

Coos Bay District

After lands are nominated and reviewed by BLM, leases on lands where the Federal government manages the oil and gas rights are offered via oral auction on a quarterly basis. The maximum lease size is 2,560 acres at a minimum bid of $2.00 per acre. An administrative fee of $75.00 per parcel is charged and each successful bidder must meet citizenship and legal requirements. Lands not leased at auction are then available for over-the-counter leasing for a period of two years. Leases are issued for a ten year term and charged a 12.5 percent royalty on production. In the first five years of a lease, annual rental is $1.50 per acre and $2.00 per acre thereafter. Leases which become productive are "held by production" and do not terminate until all wells on the lease have ceased production.

Foreseeable development of the Coos Basin CBNG play could potentially result in an additional 25,000 acres of BLM-managed lease offerings. If these offerings were sold for the 2006 average price of $17.71 per acre, based on Federal proceeds from leasing in eastern Washington, the net receipts would approach $500,000.

II. Future Trends and Assumptions

Introduction

Salem District

Based on history of past exploration; historic, current, and projected development of the Mist Gas Field; mapped geology; and foreseeable development potential in the planning area, activity over the next decade may be stable to increasing. Current development within the Mist Gas Field as well as petroleum developments and interest in other BLM Districts in Oregon, and the increasing value of petroleum products, indicates continued interest within the District. Oil and gas activity on BLM-managed mineral rights within the District is expected to consist of competitive and over-the-counter leases, geophysical surveys, and processing of Applications for Permit to Drill for approximately 68 wells.

Some exploration for CBNG in the form of coal seam investigation and mapping is predicted, but development of CBNG is not expected within the next 10 years. The supply of natural gas in the region may be augmented by one or more proposed Liquefied Natural Gas terminals. Natural gas prices are expected to rise 0.3% (2004 purchase power) by 2034 with a 0.7% increase in demand over the same period (Energy Information Administration 2007). Conscquently, while the petroleum industry does experience economic and production cycles, demand and price are projected to continue to increase.

Coos Bay District

Based on history of past drilling, current development of CBNG and foreseeable development potential in the planning area indicate activity over the next decade may be stable to increasing. Current development within the Coos Basin and the increasing value of petroleum products indicates continued interest within the District. Oil and gas activity on BLM-managed mineral rights within the District is expected to consist of competitive and over-the-counter leases, geophysical surveys, and processing of Applications for Permit to Drill for 50 to 80 wells.

Continued exploration and development for CBNG is expected. Some exploration for conventional natural gas is also predicted. The supply of natural gas in the region has been augmented by the Coos County Natural Gas Pipeline. A Liquefied Natural Gas terminal is being proposed and an associated second natural gas pipeline. These systems provide export opportunities for natural gas produced in the District. Natural gas prices are expected to rise 0.3% (2004 purchase power) by 2034, with a 0.7% increase in demand over the same period (Energy Information Administration 2007). Therefore, while the petroleum industry does experience fluctuations in economic and production cycles, demand and price are projected to continue to increase.

The speculative conventional petroleum systems are the Umpqua-Dothan-White Tail Ridge hybrid petroleum system and the Umpqua-lower Tyee Mountain petroleum system, located in the northern portion of the District are contained in the southern Tyee sedimentary basin (Ryu *et al.* 1996) (Figure 317).

System 1: The Umpqua-lower Tyee Mountain petroleum system is located in the center of the Smith River subbasin. The system may include a tight-gas sandstone reservoir. According to Ryu *et al.* (1996), gas could migrate along faults, forming small accumulations in the lower Tyee Mountain sandstones. Mudstones within the member would serve as additional seals within the traps. An unconventional overpressured tight-gas mudstone reservoir is possible in the Umpqua Group of the Smith River area. Deep wells within the system have encountered overpressured zones at approximately 7,000-foot depth. Characteristics of the zone are sufficient to generate thermogenic wet-gas (Ryu *et al.* 1996). The approximate area of this system within the District is 200 square miles. BLM-surface management consists of approximately 20 percent of that area.

System 2: The Umpqua-Dothan-White Tail Ridge Hybrid Petroleum System is located in the southern portion of the Tyee Basin, with a southern boundary defined by the Tyee Basin-Klamath Mountain contact. According to Ryu *et al.* (1996), the system may contain dry gas from both biogenic methane (similar to CBNG) and deeply buried conventional petroleum sources. It is possible the created gas migrates to accumulation zones which are located east of the District, extending into the BLM Roseburg District. It is also possible that the entire structure projects under the Klamath Mountains (Ryu *et al.* 1996). The approximate area of this system within the District is 350 square miles. BLM-surface management consists of approximately 26 percent of that area.

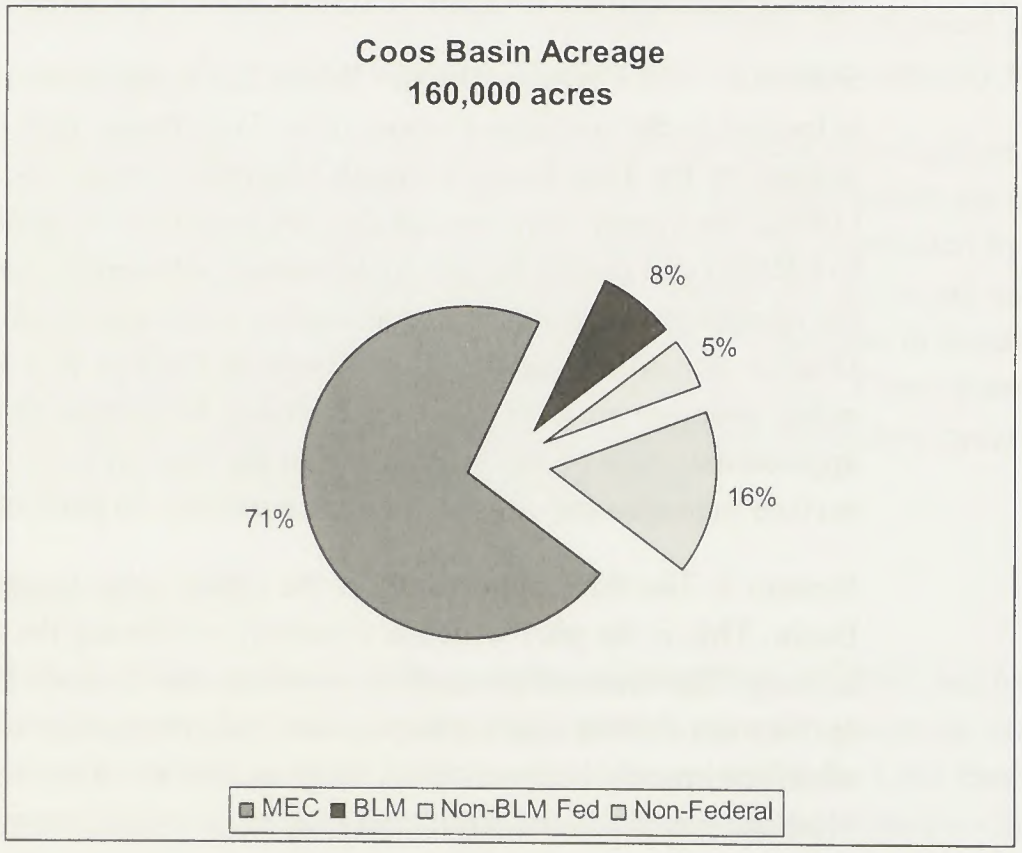
System 3: The third opportunity is the CBNG play located within the Coos Basin. This is the play which is currently producing the most interest and activity. The focus of production is within the Coaledo Formations mapped by Newton (1980). During deposition and compaction of the organic material which ultimately becomes coal, large quantities of methane are generated. Methane gas produced from coal may have lower energy content than conventional natural gas (BLM, 2001).

The approximate area of the CBNG play is 250 square miles, with producing Lower Coaledo Formation coals currently being sought at depths up to 4,500 feet. The Coos Basin is a folded structural basin, one of a series of onshore and offshore basins along the northwest coast, ranging from the Klamath Mountains north to the Columbia River in Oregon, and from the Columbia River north to the Puget Sound in Washington. The basins are located from the continental shelf offshore, east to the Willamette Valley. Sedimentary deposits including coals, sandstones, siltstones, and shales are located within these structural basins (Orr and Orr 2000).

The Coos Basin structure is controlled by compression force of the subducting easterly moving Gordia subplate and Juan de Fuca plate in relation to the overriding westerly moving North American Plate. The fold axes are oriented north-south, plunging northward. The Coaledo Formation-Flournoy Formation contact generally defines the basin boundaries to the north, east, and south. The basin is thought to extend offshore to the west. The basin's rock sequence consists of sedimentary layers of sandstone, siltstone, and shales, with coal seams (Newton 1980). Surface exposures of the basin's coal seams have been economically mined since the 1800s (Orr and Orr 2000).

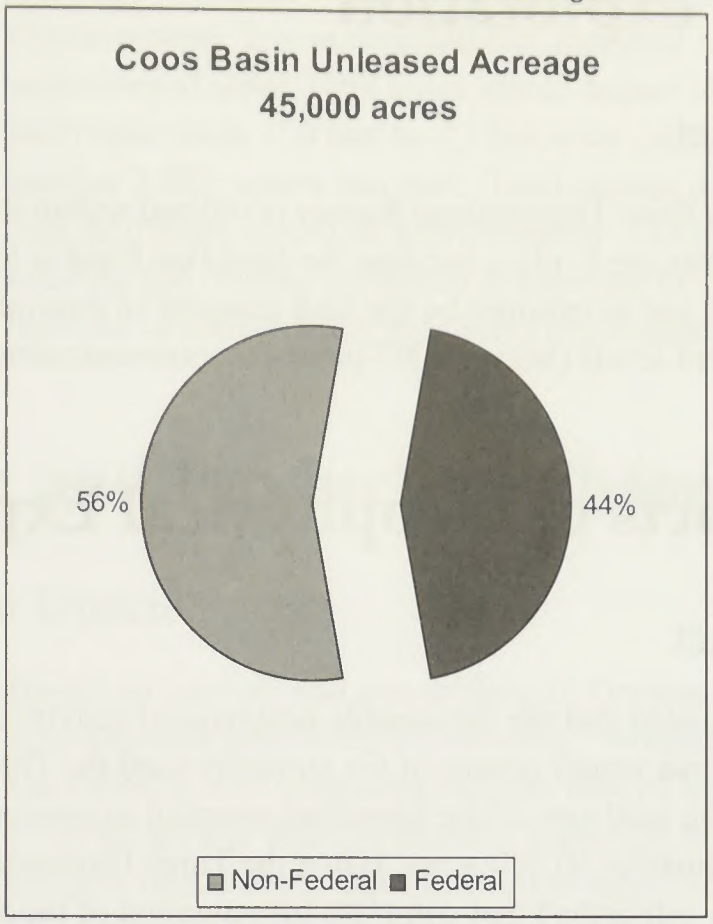
Current development of the CBNG resource is being conducted by Methane Energy Corporation which has completed numerous exploratory and production wells in the Coos Basin. The company has projected an "Area of Mutual Interest" incorporating the Coos Basin, an area of approximately 160,000 acres.

Figure 325. Coos Basin Acreage in Area of Mutual Interest.



Methane Energy Corporation maintains approximately 115,000 acres of non-federal mineral lease rights, with an estimated in-place volume of 1.2 trillion cubic feef (Sproule, 2006). Of the estimated 45,000 acres not yet controlled by lease agreements, the Federal Government manages approximately 19,694 acres or approximately 44 percent (Figure 326). Federal mineral rights account for approximately 19,694 acres of the basin area, and BLM-managed subsurface mineral rights (split and non-split estate) account for approximately 12,228 acres of the basin area. The remaining lands consist of non-federal and non-leased estate in private, City, County, and State ownership.

Figure 326. Coos Basin Unleased Acreage.



The State of Oregon Department of Geology and Mineral Industries (DOGAMI) initiated a public meeting process to establish a Gas Field Designation for the Coos Basin. The first public meeting was conducted January 29, 2007. There is only one other Gas Field Designation in Oregon, that being the Mist Gas Field, located in Northwest Oregon. The Gas Field Designation is required to fulfill state requirements to establish well spacing designations and control drainage. It may also increase competition, as more development companies may be interested in the resource after such a designation. The proposed Gas Field Designation is likely to incorporate the boundaries defined in Methane Energy Corporation's "Area of Mutual Interest". The boundary of the Gas Field Designation is simple to alter, needing only evidence of gas potential (additional formation mapping or shows of gas within a well). The designation will incorporate BLM and Forest Service lands, as well as other federal jurisdictions. (Houston, 2005)

All coal seams in western Oregon could produce CBM. However, the potential is completely unknown, as these resources have not been investigated. Potential could exist within the coal seams of the Umpqua Group, as well as their correlating formations north through the coast range. If CBM is producible in the Coos Basin, exploration could occur within these other speculative formations (May 2005).

Geophysical Exploration

Salem District

Advanced Three Dimensional Survey is utilized within the Mist Gas Field. These requirements are in place because the Mist Gas Field is located in commercial forest land and is required by the land manager to minimize disturbance to near non-existent levels (Meyer 2007-personal communications).

Surface Impacts of Geophysical Explorations

Salem District

It is anticipated that the foreseeable geophysical activity in the identified High Potential area would consist of the currently used the Three Dimensional Survey. The total area of the identified potential expansion is 81 square miles, or approximately 50,200 acres. Using the Three Dimensional Survey spacing of shots, it is anticipated that complete investigation of the area could utilize 22,950 shots. With pad ground disturbance of 12 square feet, the total disturbance area could be up to 6.3 acres. The District manages approximately 22% of the area of interest, so potential surface impacts to BLM-managed lands by Geophysical Explorations are expected to be approximately 1.4 acres. This disturbance is created exclusively with hand tools and based on experience in the Mist Gas Field, is completely reclaimed in five years or less (Meyer, 2007-personal communications). Disturbance will be less where pre-existing roads and/or landings can be used.

Coos Bay District

Geophysical exploration techniques are not commonly utilized in CBNG production, but may be utilized in developing conventional petroleum plays within the District. It is anticipated that the foreseeable geophysical activity in the planning area will consist of seismic reflection surveys, utilizing existing roads. Surface impacts would involve temporary blockage of the roads by the large trucks used to gather the data, but this type of equipment is not expected to damage the roads.

The small explosive method is also anticipated to be used on approximately 20 miles of line. Surface disturbance is expected to consist of drilling four to twelve holes per mile of line. Each drill hole would impact about 200 square feet, but 90 percent of these holes would be drilled on existing landings, spur roads, or timber haul roads. Altogether, 7,200 square feet (approximately 0.2 acre) of existing road surface would temporarily be impacted by drilling activities and low power blasting.

Blasting would not be powerful enough to impact any surface resources or improvements. It is anticipated that four drill holes would be made on currently undeveloped areas. Drill holes would impact about 200 square feet each, and short spur roads 100 feet by 25 feet wide constructed to each drilling location another 2,500 square feet each. Total surface disturbance for the anticipated four drill holes would be approximately 0.25 acre. Total surface disturbance for blasting and drilling combined is expected to total approximately 0.5 acre. An increase in conventional petroleum development would increase these estimates.

Drilling and Production Phase

Salem District

Based on past oil and gas drilling in Oregon, it is projected that three conventional petroleum exploratory "wildcat" wells would be drilled within the District. The estimated success rate of finding hydrocarbons is predicted to be no greater than 10 percent, based on the average U.S. wildcat well success rate. Future identification of additional structures would increase this estimate. Development within the identified High Potential area would be directed by Three Dimensional Survey as opposed to wildcatting (Meyer 2007-personal communications).

Coos Bay District

MEC estimates of development for CBNG for their current leases range from 300 to 719 wells. Based on well spacing assumptions (Sproule 2004) of 160 acres per well, Coos Basin development could eventually involve 436 to 1001 wells. As previously described, spacing rules will be developed during the DOGAMI Gas Field Designation process. If all remaining Federal and non-federal leasable land was open for surface occupancy, well development on federally-managed lands (BLM, USFS, and BIA) could range between 59 and 124 wells. Both highs and lows are extremes.

Figure 327. Coos Basin wells based on 338 acre spacing.

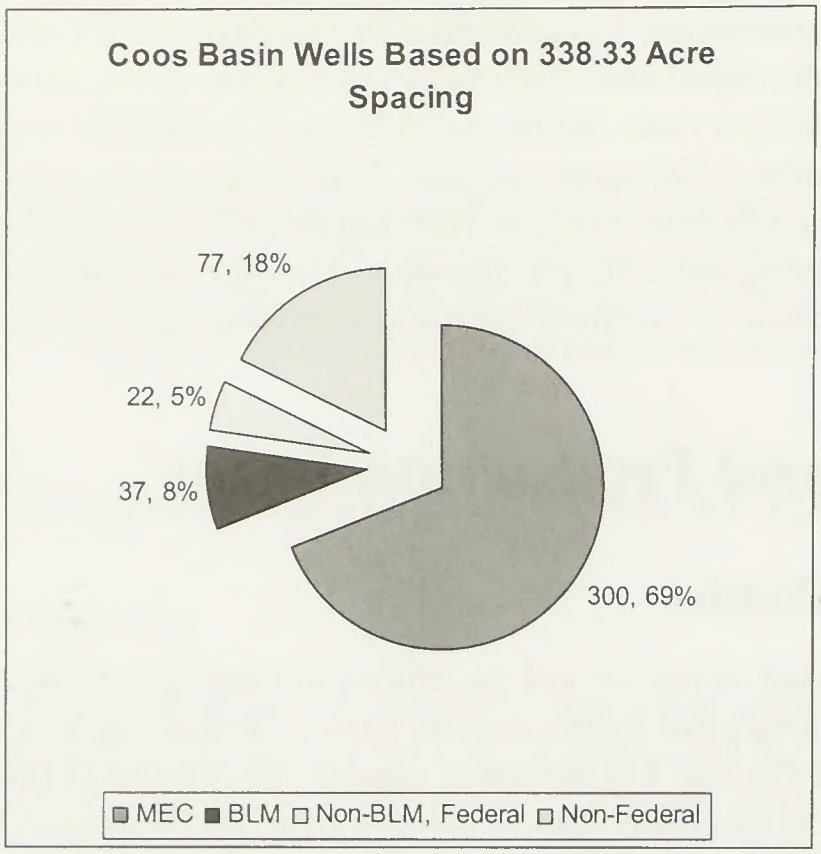
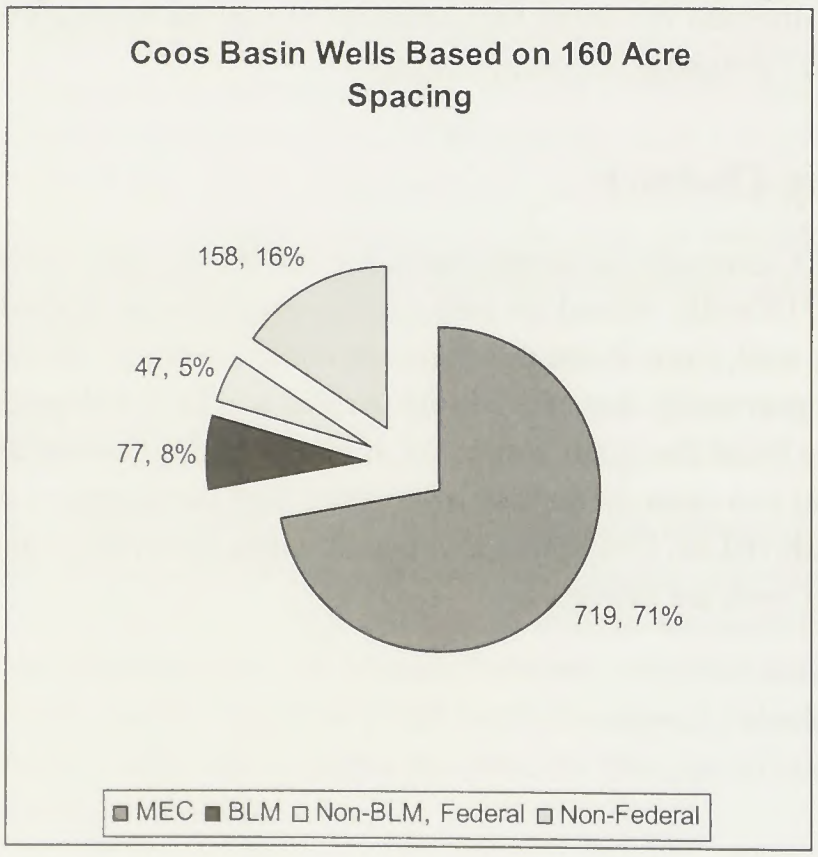


Figure 328. Coos Basin wells based on 160 acre spacing.



Surface Impacts of Drilling and Production

Salem District

The Mist Gas Field has maintained production since 1979. Over 500 wells have been permitted, although 60 wells are currently in operation. Abandoned well sites have been reclaimed and surface disturbance mitigated. Consequently, the current surface disturbance is limited to 60 wells. Development of the identified High Potential area or development of an unknown field could add an additional 314 wells, with 68 wells on BLM-managed lands. It is anticipated that all gas production would be transported by pipelines, most of which would be located within road rights-of-way. It is estimated that up to 20 miles of pipelines could be sited outside road rights-of-way. All well service requirements would be provided by established companies.

Pipelines totaling 20 miles in length within a 30-foot wide right-of-way would disturb about 72.5 acres. Due to the checkerboard public land ownership in this area, it is estimated that only 22 percent or 16 acres would be on lands administered by the BLM.

Given the existing infrastructure of the Mist Gas Field, timber management of other lands within the District, the amount of existing roads within the identified High Potential Area, use of Three Dimensional Survey to optimize directional drilling, the ability to place multiple wells on a single pad (Meyer 2007-personal communications), and development scenarios of other BLM Oregon Districts, it is anticipated that most well development will utilize existing road infrastructure to develop the resource. However, it may be necessary to construct up to ¼-mile of access road for each pad to remove the facilities from active roadways. Based on the ability to cluster wells, an assumption for calculation of four wells per pad was used. Therefore, it is estimated that no more than 20 miles of new road construction would be needed in full development. This would be moderate duty access road with a surface 18 to 20 feet wide, anticipated to be constructed on both private and BLM-managed lands. The clearing width would average 40 feet including ditches, utilities, pipelines, cuts, and fills. The total acreage impacted would total approximately 97 acres for all lands within the District, approximately 22 acres of which would involve BLM-managed lands. Roads not retained for other resource management purposes would be reclaimed at the end of the project.

Total disturbance of both BLM-managed lands and other lands for wells, support services, pipeline and new road construction is expected to be approximately 1,426 acres or 2.8% of the total High Potential acreage. Surface disturbance would be restricted, as much as possible, to previously disturbed areas such as logging roads and landings. Industry is currently utilizing a multi-well to single pad approach which minimizes impact. Interim reclamation will also reduce initial disturbance. After initial construction, well sites pad areas will be

reclaimed while the wells are in production. Disturbance will be limited to areas within overwork foundation structures and necessary infrastructure, such as well heads, pipelines, and access roads.

Coos Bay District

It is estimated that the productive life span of a single well within the CBNG could range to greater than 14 years. Total lifespan of the field would be determined on the type of phased development and exploration of the previously untested deeper resources greater than 4,000 feet. All gas production would be carried by pipelines. Most, if not all, pipeline will be contained within road rights-of-way. It is estimated that up to 40 miles of pipeline could occur outside a road right-of-way. Additional conventional petroleum structures totaling 550 square miles have also been identified within the District.

Based on potential for resource development (described above) and utilizing access road built for well accessed timber development (most likely for the BLM-managed parcels within the Coos Basin), it was estimated that between five to no more than 10 miles of moderate duty access road with a surface 18 to 20 feet wide is anticipated to be constructed. The surface disturbance width would average 40 feet including ditches, utilities, pipelines, cuts, and fills. The acreage impacted by new road building would total between approximately 24.25 acres and 48.5 acres for the District. Roads not incorporated into other resource management would be reclaimed at the end of the project.

Altogether, the total disturbance for the wells, support services, and new road construction on BLM-managed mineral estate is expected to range between 194.25 acres (1.6% of BLM-managed area: 37 wells) to 404.25 acres (3.3% of BLM-managed area: 77 wells). Surface disturbance would be restricted, as much as possible, to previously disturbed areas such as logging roads and landings. Industry is currently utilizing a multi-well to single pad approach which minimizes impact.

A pipeline 40 miles in length with a right-of-way width of 30 feet would disturb about 145 acres. Due to the checkerboard public land ownership in this area, it is estimated that only 50 percent of that acreage would be on public lands administered by the BLM. Altogether, it is estimated that about 73 acres of BLM-administered land would be impacted from pipeline construction. The total surface disturbance of field development and production on BLM-managed land would range between 291.5 acres and 525.75 acres.

Total field development disturbance within the District, both Federal and non-Federal, could range between 2,289 acres (338.33 acre well spacing) and 5,255.25 acres (160 acre well spacing). Communitization and Unitization agreements (both State and Federal) can drastically reduce surface disturbance

for both Federal and Non-Federal lands. These cooperative agreements allow the sharing of wells, pads, and infrastructure, combining uses and minimizing the need for new development.

Limitations

Salem District

The acreage estimates used for BLM-managed surface estate are based upon current GIS layers. The accuracy of this information has not been verified by Master Title Plat Maps. The GIS coverage for subsurface estate within the District is incomplete. Therefore, the existence and location of BLM-managed subsurface estate on the District is unknown.

A brief review of the Master Title Plat Maps was completed within and near the 1985 Mist Gas Field boundaries. Federal subsurface estate identified on the Master Title Plat Maps was not recorded on the GIS layers. Most of the Master Title Plat Maps identified federal subsurface parcels outside the Mist Gas Field boundaries. Due to the incompleteness of the GIS layers, especially within subsurface estate, the potential of BLM-managed subsurface estate was not addressed in this report.

Proposed Restrictions and Requirements on Mineral and Energy Exploration and Development Activity

Introduction

This appendix discusses the leasing stipulations as they will be applied to BLM managed lands in the planning area under each alternative. Operating standards pertinent to the locatable and salable minerals program are also described. Mineral exploration and development on Federal lands must also comply with laws and regulations administered by several agencies of the State of Oregon; however, these requirements are not discussed in this document.

Leasable Mineral Resources

Oil and Gas Leasing

The Mineral Leasing Act of 1920 (as amended) provides that all publicly owned oil and gas resources be open to leasing, unless a specific land order has been issued to close the area. Through the land use planning process, the availability of these resources for leasing is analyzed, taking into consideration development potential and surface resources. Constraints on oil and gas operations are identified and placed in the leases as notices and stipulations. Oil and gas leases are then issued from the BLM Oregon State Office in Portland. Specific proposed notices and stipulations are listed by alternative later in this appendix.

The issuance of a lease conveys to the lessee an authorization to actively explore and/or develop the lease, in accordance with the attached stipulations and the standard terms outlined in the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA). Restrictions on oil and gas activities in the planning area will take the form of timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

The field office which reviews the lease tract will attach stipulations to each lease before it is offered for bid. The review will be conducted by consulting the direction given in this Resource Management Plan. In addition, all lands administered by BLM within the planning area will be subject to the lease notices as shown on the following pages. All Federal lessees or operators are required to follow procedures set forth by: Onshore Oil and Gas Orders, Notices to Lessee (NTL), The Federal Oil and Gas Royalty Management Act (as amended), The

Federal Onshore Oil and Gas Leasing Reform Act, and Title 43 Code of Federal Regulations, Part 3100.

Oil and Gas Operations

Geophysical Exploration

Geophysical operations may be conducted regardless of whether the land is leased or not. Notices to conduct geophysical operations on BLM surface are received by the Resource Area. Administration and surface protection are accomplished through close cooperation of the operator and the BLM. Seasonal restrictions may be imposed to reduce fire hazards, conflicts with wildlife, watershed damage, etc. An operator is required to file a "Notice of Intent to Conduct Oil and Gas Exploration Operations" for all geophysical activities on public land administered by BLM. The notice should adequately show the location and access routes, anticipated surface damages, and time frame. The operator is required to comply with written instructions and orders given by the Authorized Officer, and must be bonded. Signing of the Notice of Intent by the operator signifies agreement to comply with the terms and conditions of the notice, regulations, and other requirements prescribed by the Authorized Officer. A pre-work conference and/or site inspection may be required. Periodic checks during and upon completion of the operations will be conducted to ensure compliance with the terms of Notice of Intent, including reclamation.

Drilling Permit Process

The federal lessee or operating company selects a drill site based on spacing requirements, subsurface and surface geology, geophysics, topography, and economic considerations. Well spacing is determined by topography, reservoir characteristics, protection of correlative rights, potential for well interference, interference with multiple-use of lands, and protection of the surface and subsurface environments. Close coordination with the State would take place. Written field spacing orders are issued for each field. Exceptions to spacing requirements involving Federal lands may be granted after joint State and BLM review.

Notice of Staking

Once the company makes the decision to drill, it must decide whether to submit a Notice of Staking or apply directly for a permit to drill. The Notice of Staking is an outline of what the company intends to do, including a location map and sketched site plan. The Notice of Staking is used to review any conflicts with known critical resource values and to identify the need for associated rights-of-

way and special use permits. The BLM utilizes information contained in the Notice of Staking and obtained from the on-site inspection to develop conditions of approval to be incorporated into the application for permit to drill. Upon receipt of the Notice of Staking, the BLM posts the document and pertinent information about the proposed well in the District Office for a minimum of 30 days prior to approval, for review and comment by the public.

Application for Permit to Drill (APD)

The operator mayor may not choose to submit a Notice of Staking; in either case, an Application for Permit to Drill must be submitted prior to drilling. An Application for Permit to Drill consists of two main parts: a 12-point surface plan that describes any surface disturbances and is reviewed by resource specialists for adequacy with regard to lease stipulations designed to mitigate impacts to identified resource conflicts with the specific proposal, and an 8-point subsurface plan that details the drilling program and is reviewed by the staff petroleum engineer and geologist. This plan includes provisions for casing, cementing, well control, and other safety requirements. For the Application for Permit to Drill option, the on-site inspection is used to assess possible impacts and develop provisions to minimize these impacts.

Geothermal Leasing

The Geothermal Steam Act of 1970 (as amended) provides for the issuance of leases for the development and utilization of geothermal steam and associated geothermal resources. Geothermal leasing and operational regulations are contained in Title 43 Code of Federal Regulations, Part 3200. Through the land use planning process the availability of the geothermal resources for leasing is analyzed, taking into consideration development potential and surface and subsurface resources. Constraints on geothermal operations are identified and placed in the leases as stipulations. Geothermal leases are then issued by the BLM Oregon Statc Office in Portland.

Geothermal resources are first offered by competitive sale. Prior to a competitive lease sale, or the issuance of a noncompetitive lease, each tract will be reviewed, and appropriate lease stipulations will be included. The review will be conducted by consulting the direction given in this resource management plan. The issuance of a lease conveys to the lessee authorization to actively explore and/or develop the lease in accordance with regulations and lease terms and attached stipulations. Subsequent lease operations must be conducted in accordance with the regulations, Geothermal Resources Operational Orders, and any Conditions of Approval developed as a result of site-specific NEPA analysis. In the planning area, restrictions in some areas will include timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

In addition to restrictions related to the protection of surface resources, the various stipulations and conditions could contain requirements related to protection of subsurface resources. These may involve drainage protection of geothermal zones, protection of aquifers from contamination, or assumption of responsibility for any unplugged wells on the lease. Development of geothermal resources can be done only on approved leases. Orderly development of a geothermal resource, from exploration to production, involves several major phases that must be approved separately. Each phase must undergo the appropriate level of NEPA compliance before it is approved and subsequent authorization(s) is (are) issued.

Leasing Notice and Stipulation Summary

On the following pages, the mineral leasing notices and stipulations are shown as common for all alternatives are considered to be the minimum necessary in order to issue leases in the operating area. Under all alternatives, the standard and the special status species leasing stipulations will be utilized on most lands. The powersite stipulation (Form 3730-1) would be utilized on lands within powersite reservations.

Stipulations also include waiver, exception, and modification criteria defined below. If the Authorized Officer determines that a stipulation involves an issue of major concern, waivers, exceptions, or modifications of the stipulation will be subject to at least a 30-day advance public review. Waiver, exception, and modification are defined as follows:

Waiver - The lifting of a stipulation from a lease that constitutes a permanent revocation of the stipulation from that time forward. The stipulation no longer applies anywhere within the leasehold.

Exception - This is a one time lifting of the stipulation to allow an activity for a specific proposal. This is a case-by-case exemption. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria apply. It has no permanent effect on the lease stipulation.

Modification - This is a change to a stipulation that either temporarily suspends the stipulation requirement or permanently lifts the application of the stipulation on a given portion of the lease. Depending on the specific modification, the stipulation mayor may not apply to all other sites within the leasehold to which the restrictive criteria apply.

Whenever a special stipulation, such as No Surface Occupancy (NSO), Timing, or Controlled Surface Use (CSU) is used, the need for the special stipulation is described in the "Objective" that follows the stipulation. By imposing these special stipulations, it has been concluded that less restrictive stipulations would not be adequate to meet the stated objective.

Leasing Notices

The following Notices are to be included in eaeh lease for all lands administered by BLM within the planning area where the pertinent resource potential exists. Lease notiees are attached to leases in the same manner as stipulations; however, there is an important distinetion between lease notiees and stipulations: lease notiees do not involve new restrictions or requirements. Any requirements eontained in a lease notiee must be fully supported by either laws, regulations, policy, onshore oil and gas orders, or geothermal resourees operational orders.

Leasing Notices Common to All Alternatives

Notice

Special Status Speeies Stipulation

Resourees: Botany and Wildlife

Stipulation: (All the)/(Certain) lands within this lease are within the suitable habitat of the (identify all Federal Threatened (FT), Endangered (FE) or Proposed Threatened (PT) & Proposed Endangered (PE) speeies, including scientific names), (an offieially listed)/(a proposed for listing) Threatened or Endangered species. The Authorized Officer, through an environmental review process, has determined that beeause of the habitat eharacteristics of this species, all future post-lease operations must be analyzed and subjected to a U.S. Fish and Wildlife Service (FWS) Seetion 7 eonsultation or eonference to ensure the aetion is not likely to jeopardize the continued existence of the speeies or result in the destruction or adverse modification of eritieal habitat.

(All the)/(Certain) lands within this lease are known to bear the speeies listed (Insert list of speeies) which has (have) protected status as (State Threatened (ST); State Endangered (SE); Federal Candidate (FC); Bureau Sensitive (BS)); or are within the suitable habitat of (identify all State Threatened, State Endangered, Federal Candidate, or Bureau Sensitive speeies, including scientifie names). These speeies are proteeted by BLM policy as described in Manual 6840. All future post-lease operations must be analyzed, utilizing reeent field data collected at the proper time of year, to identify the presence of sueh species. If the field examination indicates that the proposed activity may adversely impaet FC species, technical assistance will be obtained from FWS to insure that actions will not eontribute to the need to list a federal candidate as a federal threatened or endangered speeies. Technical assistance may be obtained from FWS to insure that aetions will not eontribute to the need to list a ST, SE, or BS speeies as a federal threatened or endangered species.

Therefore, prior to any surface disturbing activities or the use of vehicles off existing roads on (this lease)/(the lands legally described as: _____), BLM approval is required. This restriction also applies to geophysical activities for which a permit is required. The approval is contingent upon the results of site specific inventories for any of the above mentioned species. The timing of these inventories is critical. They must be conducted at a time of year appropriate to determine the presence of the species or its habitat. The lessee is hereby notified that the process will take longer than the normal 30 days and that surface activity approval will be delayed.

If no FT, FE, PT, or PE species, or suitable habitat, are found during the inventories, then no formal Section 7 consultation with the FWS will be necessary and the action will be processed using the procedures found in the applicable oil and gas Onshore Orders or geothermal resources operational orders. However, the lessee is hereby notified that, if any FT, FE, PT, PE, ST, SE, FC, or BS species are found during the inventories, or if the actions are proposed in designated or proposed critical habitat, then surface disturbing activities may be prohibited on portions of, or even all of the lease, unless an alternative is available that meets all of the following criteria: (a) The proposed action is not likely to jeopardize the continued existence of a threatened or endangered species; (b) the proposed action is not likely to destroy or adversely modify critical habitat for a threatened or endangered species; (c) the proposed action is consistent with the recovery needs in approved Fish and Wildlife Service recovery plans or BLM Habitat Management Plans for the threatened or endangered species; and (d) the proposed action will not contribute to the need to list species as federal threatened or endangered.

Objective: To protect officially listed or proposed threatened or endangered plant or wildlife species; and to insure that post leasing oil and gas or geothermal operations will not likely contribute to the need to list other special status species as threatened or endangered.

Exception: An exception may be granted by the Authorized Officer, if review of the proposed plan submitted by the operator indicates that the proposed action will have no effect on the (common name of species).

Modification: The boundaries of the stipulated area may be modified, by the Authorized Officer, if it is determined that portions of the area do no have any officially listed or proposed threatened or endangered species, federal candidate, state threatened or endangered species, or Bureau sensitive species, or their habitat.

Waiver: This stipulation may be waived if the (common name) is declared recovered and is no longer protected under the Endangered

Species Act, or if other species found within the lease are no longer considered to be in the federal candidate, state threatened or endangered, or Bureau sensitive categories.

Notice

Cultural Resources: An inventory of the leased lands may be required prior to surface disturbance to determine if cultural resources are present and to identify needed mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator shall:

1. Contact the Bureau of Land Management (BLM) to determine if a cultural resource inventory is required. If an inventory is required, then;
2. The BLM will complete the required inventory; or the lessee or operator, at their option, may engage the services of a cultural resource consultant acceptable to the BLM to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the standard ten-acre minimum to cover possible site relocation, which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the BLM for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted.
3. Implement mitigation measures required by the BLM. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as data recovery and extensive recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the BLM, surface occupancy on that area must be prohibited. The lessee or operator shall immediately bring to the attention of the BLM any cultural resources discovered as a result of approved operations under this lease, and shall not disturb such discoveries until directed to proceed by the BLM.

Authorities: Compliance with Section 106 of the National Historic Preservation Act is required for all actions which may affect cultural properties eligible to the National Register of Historic Places. Section 6 of the Oil and Gas Lease Terms (Form 3100-11) requires that operations be conducted in a manner that minimizes adverse impacts to cultural and other resources.

Special Leasing Stipulations

The following special stipulations are to be utilized on specifically designated tracts of land as described under the various alternatives.

Leasing Stipulations Common To All Alternatives

No Surface Occupancy

Resource: Land Use Authorizations

Stipulation: Surface occupancy and use is prohibited on Recreation and Public Purposes (R&PP) and FLPMA leases.

Objective: To protect uses on existing R&PP and FLPMA leases.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if the land use authorization boundaries are modified.

Waiver: This stipulation may be waived by the Authorized Officer, if all land use authorizations within the leasehold have been terminated, canceled, or relinquished.

No Surface Occupancy

Resource: Recreation Sites

Stipulation: Surface occupancy and use are prohibited within developed recreation areas.

Objective: To protect developed recreation areas.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the recreation area boundaries are changed.

Waiver: This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains developed recreation areas.

No Surface Occupancy

A 30-day public notice period will be required prior to modification or waiver of this stipulation.

Resource: Special Areas

Stipulation: Surface occupancy and use are prohibited within Areas of Critical Environmental Concern (ACEC).

Objective: To protect important historic, cultural, scenic values, natural resources, natural systems or processes, threatened and endangered plant species, and/or natural hazard areas of the ACEC.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the ACEC or EEA boundaries are changed.

Waiver: This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains designated ACECs or EEAs.

No Surface Occupancy

Resource: Progeny test sites.

Stipulation: Surface occupancy and use are prohibited within progeny test sites.

Objective: To protect progeny test sites.

Exception: None.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the progeny test site boundaries are changed.

Waiver: This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains progeny test sites.

No Surface Occupancy

A 30-day public notice period will be required prior to modification or waiver of this stipulation.

Stipulation: Surface occupancy and use are prohibited in VRM Class I areas.

Resource: Visual Resource Management (VRM) Class I

Objective: To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas subject to slope failure, mass wasting, piping, or having excessive reclamation problems.

Objective: To preserve the existing character of the landscape.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the boundaries of the VRM Class I area are changed.

Waiver: This stipulation may be waived by the Authorized Officer, if all VRM Class I areas within the leasehold are reduced to a lower VRM class. Areas reduced to VRM Class II will be subject to the Controlled Surface Use stipulation for visual resources, and areas reduced to VRM Class III will be subject to standard lease stipulations.

Controlled Surface Use

Resource: Soils

Stipulation: Prior to disturbance of any suspected unstable slopes or slopes over 60 percent, an engineering/reclamation plan must be approved by the Authorized Officer. Such plan must demonstrate how the following will be accomplished:

- Site productivity will be restored.
- Surface runoff will be adequately controlled.
- Off-site areas will be protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting.
- Water quality and quantity will be in conformance with state and federal water quality laws.
- Surface-disturbing activities will not be conducted during extended wet periods.
- Construction will not be allowed when soils are frozen.

Exception: An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan, which demonstrates that the impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include suspected unstable slopes or slopes over 60 percent.

Waiver: This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include any suspected unstable slopes or slopes over 60 percent.

Controlled Surface Use

A 30-day public notice period will be required prior to modification or waiver of this stipulation.

Resource: Visual Resource Management (VRM) Class II.

Stipulation: All surface-disturbing activities, semipermanent and permanent facilities in VRM Class II areas may require special design including location, painting and camouflage to blend with the natural surroundings and meet the visual quality objectives for the area.

Objective: To control the visual impacts of activities and facilities within acceptable levels.

Exception: None.

Modification: None.

Waiver: This stipulation may be waived, if the Authorized Officer determines that there are no longer any VRM Class II areas in the leasehold.

No Additional Leasing Stipulations for the No Action Alternative

No Additional Leasing Stipulations for Alternative A

Controlled Surface Use

Resource: Designated Mature and Old-Growth Forest Seral Stage Blocks

Stipulation: Unless otherwise authorized, drill site construction and access through designated mature and old-growth forest blocks within this leasehold will be limited to established roadways.

Objective: To protect vegetation to retain and/or restore older forests for seral stage diversity.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates

that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include designated mature and old-growth forest blocks.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes designated mature and old-growth forest blocks.

Controlled Surface Use

Resource: Riparian Management Areas.

Stipulation: Unless otherwise authorized, drill site construction and access through riparian management areas within this leasehold will be limited to established roadways.

Objective: To protect riparian vegetation and reduce sedimentation.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include riparian areas, flood plains, or water bodies.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes riparian management areas.

Controlled Surface Use

Resource: Habitat Conservation Areas for the Northern Spotted Owl.

Stipulation: Unless otherwise authorized, drill site construction and access through habitat conservation areas within this leasehold will be limited to established roadways.

Objective: To protect habitat of the Northern Spotted Owl.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include habitat conservation areas.

Waiver: This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes habitat conservation areas, after consultation with the U.S. Fish and Wildlife Service.

Locatable Minerals Surface Management Standards for Exploration, Mining, and Reclamation

The following operational standards for mining activities have been compiled to assist the miner in complying with the 43 CFR 3809 regulations, which apply to all mining operations on BLM administered lands. The manner in which the necessary work is to be done will be site specific and all of the following standards may not apply to every mining operation. It is the mining claimant's and operator's responsibility to avoid "unnecessary or undue degradation," and to perform all the necessary reclamation work. Refer to the 43 CFR 3809 regulations for general requirements.

There is an intergovernmental agreement between the BLM and the Oregon Department of Geology and Mineral Industries that is designed to avoid duplication of regulations, inspections, and approval of reclamation plans as well as to minimize repetitive costs to mining operators. The following guidelines include some, but not all, of the requirements of the various State agencies overseeing mining operations.

Prospecting, Exploration, and Mining

Surface Disturbance

BLM Requirements

Operations ordinarily resulting in only negligible disturbance as defined in 43 CFR 3809.0-5(b) are considered to be casual use and no notification to or approval by the BLM is required. All operators proposing occupancy, timber removal, use of mechanized earth moving equipment, or suction dredges having hoses with an inside diameter greater than 4 inches which would cause a surface disturbance of 5 acres or less during any calendar year must provide written notice to the District Office at least 15 days prior to the commencement of any surface mining disturbance. For operations in sensitive areas or which will cause greater than 5 acres of surface disturbance, the operator is required to submit a plan of operations pursuant to the regulations in 43 CFR 3809.1-4.

State of Oregon Requirements

Any person engaging in mineral exploration that disturbs more than one surface acre or involves drilling to greater than 50 feet must obtain an exploration permit from the Oregon Department of Geology and Mineral Industries (DOGAMI). Mining operations involving 5,000 or more cubic yards of material per year or disturbing one or more acres of land will require an operating permit from DOGAMI.

Vegetation/Timber Removal

Remove only that vegetation which is in the way of mining activities. An application must be submitted to the Authorized Officer pursuant to 43 CFR 3821.4 describing the proposed use of merchantable timber from 0 & C lands for mining purposes. No merchantable trees may be cut until the application is approved and the trees are marked. The Roseburg BLM office recommends that small trees (less than 7 inches dbh) and shrubs be lopped and scattered, or shredded for use as mulch. Trees greater than or equal to 7 inches diameter breast height (dbh) are to be bucked and stacked in an accessible location unless they are needed for the mining operation

Firewood

Merchantable timber may not be used for firewood. Firewood permits may be issued to the operator for use in conjunction with the mining operation but no wood may be used until a permit is obtained from the BLM. Permits will be limited to hardwoods or salvage timber which is not considered to be merchantable. Firewood authorized for use in conjunction with a mining operation is not to be removed from the mining claim.

Topsoil

All excavations should have all the productive topsoil (usually the top 12 to 18 inches) first stripped, stockpiled, and protected from erosion for use in future reclamation. This also includes removal of topsoil before the establishment of mining waste dumps and tailings ponds, if the waste material will be left in place during reclamation.

Roads

Existing roads and trails should be used as much as possible. Temporary roads are to be constructed to a minimum width and with minimum cuts and fills. All roads shall be constructed so as to minimize negative impacts to slope stability.

Water Quality

When mining will be in or near bodies of water, or sediment (or other pollutants) will be discharged, contact the Department of Environmental Quality. A settling pond is required when mining operations discharge turbid water. It is the operator's responsibility to obtain any needed suction dredging, stream bed alteration, or water discharge permits required by the DEQ or other State agencies. Copies of such permits shall be provided to the Authorized Officer when a Notice or Plan of Operations is filed. All operations including casual use, shall be conducted in a manner so as to prevent unnecessary or undue degradation of surface and subsurface water resources and shall comply with all pertinent Federal and State water quality laws.

Claim Monuments

State law prohibits the use of plastic pipe for claim staking in Oregon. BLM policy requires all existing plastic pipe monuments to have all openings permanently closed. Upon loss or abandonment of the claim, all plastic pipe must be removed from the public lands. When old markers are replaced during normal claim maintenance, they shall be either wood posts or stone or earth mounds, constructed in accordance with the requirements of State law.

Drill Sites

Exploratory drill sites should be located next to or on existing roads when possible without blocking public access. When drill sites must be constructed, the size of the disturbance shall be as small as possible. operations. Any operator engaging in mineral exploration that involves drilling to greater than 50 feet must obtain an exploration permit from the Oregon Department of Geology and Mineral Industries (ORS 517.962).

Dust and Erosion Control

While in operation, and during periods of shut-down, exposed ground surfaces susceptible to erosion will need to be protected. This can be accomplished with seeding, mulching, installation of water diversions, and routine watering of dust producing surfaces.

Fire Safety

All State fire regulations must be followed, including obtaining a campfire permit or blasting permit, if needed. All internal gas combustion engines must be equipped with approved spark arresters.

Safety and Public Access

Under Public Law 167, the Government has the right to dispose and manage surface resources (including timber) on mining claims located

after July 23, 1955. These rights are limited to the extent that they do not endanger or materially interfere with any phase of an ongoing mining operation or uses reasonably incident thereto. Claims located prior to July 23, 1955 may have surface rights, if such claims were verified as being valid under Sections 5 and 6 of the Act. Most do not.

Mining claimants shall not exclude the public from mining claims with force, intimidation, or no trespassing signs. In the interest of safety, the general public can be restricted only from specific dangerous areas (underground mines~ open pits or heavy equipment storage areas) by erecting fences, gates and warning signs. It is the operator's responsibility to protect the public from mining hazards. Gates or road blocks may be installed on existing or proposed roads only with BLM approval. Gates restricting public access onto a mine site will only be considered in such cases where there is a large area safety hazard created by the mining activity. The determination as to whether a safety hazard is large enough to warrant a gate will be determined on a case-by-case basis. Fences (rather than gates) or other approved barriers shall be utilized to protect the public from hazards related to small excavations, tunnels, and shafts.

Roads which cross private land to reach BLM administered lands are controlled by the private parties. While some of these roads have been assigned BLM road numbers access may only be granted for administrative use to the BLM, and its licensees and permittees under a nonexclusive easement. Mining claimants are not considered licensees or permittees and so must make their own arrangements with the private party in order to use such roads. No right is granted under any of the mining laws to use a road involved in a nonexclusive easement.

Sewage

Self-contained or chemical toilets are generally to be used at exploration or mining operations and their contents shall be disposed of at approved dump stations. Outhouses and uncontained pit toilets are considered unnecessary and undue degradation and are not allowed. Uncontained pit toilets are not allowed for other users of the public land in this district, and we believe no special rights regarding this issue are granted under the mining laws. County sanitation permits are required for all other types of sanitation facilities.

Structures

Permanent structures will not be allowed for exploration or prospecting operations. Permanent structures are fixed to the ground by any of the various types of foundations, slabs, piers, poles, or other means allowed by State or County building codes. The term shall also include a structure placed on the ground that lacks foundations, slabs, piers or poles, and

that can only be moved through disassembly into its component parts or by techniques commonly used in house moving. Any temporary structures placed on public lands in conjunction with prospecting or exploration are allowed only for the duration of such activities, unless expressly allowed in writing by the Authorized Officer to remain on the public lands. Temporary structures are defined as structures not fixed to the ground by a foundation and that can be moved without disassembly into their component parts.

Permanent structures (as described above) may be allowed for mining operations if they are deemed reasonably incident to conducting the operations. Mining operations are defined as all functions, work, facilities, and activities in connection with development, mining, or processing mineral deposits.

All permanent or temporary structures placed on public lands shall conform with the appropriate State or local building, fire, and electrical codes, and occupational safety and health and mine safety standards.

Equipment

The claimant must maintain the claim site, including structures and equipment, in a safe and orderly condition. Only equipment and supplies that are appropriate, reasonable, and regularly used for exploration or mining will be allowed on the claim. Equipment transportable by a pickup or small trailer or used only infrequently should not be stored 0171 the claim and will not be considered as a justification for site occupancy. Accumulation of unused and/or inoperable equipment, materials not related to actual operations, and trash, garbage, or junk is not allowed on the public lands. The storage of such on the public land is unnecessary and undue degradation and will be treated accordingly.

Animals

If dogs or cats are to be present at the work site, the operator is required to keep them under control at all times so that they do not chase wildlife, or threaten other people, including government employees conducting site inspections on the public lands. Unless otherwise permitted, animals such as cows, chickens, goats, pigs or horses are not considered necessary to conduct mining operations and are not allowed on mining claims.

Suction Dredging

BLM Requirements

Cases Where a Notice or Plan of Operations is Required

Filing either a Notice or Plan of Operations may be required for all suction dredge operations where the dredge has an intake nozzle equal to or greater than 4 inches in diameter, or where any suction dredge operator proposes occupancy on BLM land (in excess of 14 calendar days per year) or the installation of structures of any kind. The determination of the need for a notice on smaller dredges will be made on a case by case basis.

No Notice or Plan of Operations Required

The use of a suction dredge in a stream and having an intake nozzle of less than 4 inches in diameter, where no structures or occupancy beyond the 14 calendar day per year camping limit is proposed, will not generally require the filing of a Notice or Plan of Operations. Such activity is generally considered casual use.

State of Oregon Requirements

All suction dredge operations must be authorized by Permit #0700-J issued by the Department of Environmental Quality. This permit is issued free of charge for dredges having hoses with an inside diameter of 4 inches or less. Registration and a filing fee of $50.00 is required for suction dredges having hoses with an inside diameter greater than 4 inches. Mining operators should contact the Department of Environmental Quality, Water Quality Division, 811 S.W. Sixth Avenue, Portland, Oregon 97204, or the Roseburg DEQ office.

Suction dredging outside the "permitted work period" established for certain waterways by the Oregon Department of Fish and Wildlife (ODFW) will require written permission by an appropriate ODFW District Biologist.

The river beds of navigable waterways are controlled by the Oregon Division of State Lands.

Tailings Ponds

Settling ponds must be used to contain sediment, and any discharge must meet the standards of the Oregon Department of Environmental Quality.

Solid and Hazardous Waste

Trash, garbage, used oil, etc. must be removed from public land and disposed of properly. Trash, garbage or hazardous wastes must not be buried on public lands. The accumulation of trash, debris, or inoperable equipment on public lands is viewed as unnecessary degradation and will not be tolerated. Operators conducting illegal disposals shall be held financially responsible for the clean-up of such disposals.

Cultural and Paleontological Resources

Operators shall not knowingly alter, injure, or destroy any scientifically important paleontological (fossil) remains or any historical or archaeological site, structure, or object on federal lands or any identified traditional use areas. The operator shall immediately bring to the attention of the Authorized Officer, any paleontological (fossil) remains or any historical or archaeological site, identified traditional cultural properties, structure, or object that might be altered or destroyed by exploration or mining operations, and shall leave such discovery intact until told to proceed by the Authorized Officer. The Authorized Officer shall evaluate the discovery, take action to protect or remove the resource, and allow operations to proceed.

Threatened and Endangered Species of Plants and Animals

Operators shall take such action as may be needed to prevent adverse impacts to threatened or(endangered species of plants and animals and their habitat that may be affected by operations, as stipulated in guidelines developed through consultation with the U.S. Fish and Wildlife Service. Under Notice-level operations, if the review of the notice by BLM reveals that a potential conflict with a threatened or endangered species exists, the operator will be advised not to proceed and informed that a knowing violation of the taking provision of the Endangered Species Act will result in a notice of noncompliance and may result in criminal penalties. If the operator wishes to develop measures that will eliminate the conflict, then the Authorized Officer will arrange for the participation of BLM resource specialists and the U.S. Fish and Wildlife Service in , reviewing the proposed revision to the Notice. If processing a proposed Plan of Operations indicates that a potential conflict exists with a threatened or endangered species or its habitat, the Authorized Officer shall notify the operator that the plan cannot be approved until BLM has complied with Section 7 of the Endangered Species Act. Special status species (Federal Candidate/ Bureau Sensitive) plants and animals, and their habitat will be identified by the Authorized Officer, and shall be avoided wherever possible.

Occupancy at Mining Sites

Living on public land, in excess of 14 days per calendar year, must be reasonably incident to and required for actual continuous mining or diligent exploration operations and will require either a Notice or Plan of Operations. In general, operations at the casual use level are not sufficient to warrant occupancy on a mining claim. The following discussion of occupancy only applies to those operators wishing to assert their right to live for an extended period or full-time on public lands pursuant to privileges granted under the mining laws. It does not apply to operators proposing to camp at prospecting or mining sites on weekends or one to two days during the week

Only those persons working on a continuous mining or exploration operation will be allowed to live on the claim beyond the 14-day per calendar year camping limit. A continuous mining or exploration operation is defined as an operation necessitating at least 40 hours of work per week at the operating site. The Oregon State Bureau of Labor and Industries generally considers that full-time work consists of a minimum of 40 hours worked per week. Each person proposing to live full-time at the site would be expected to conduct a minimum of 40 hours of work each week. Work hours are to be specified in the Notice or Plan of Operation at the time of submittal to the district BLM office. Should work hours be altered periodically or seasonally, it is the responsibility of the operator to notify the BLM (prior to the change) so that the Notice or Plan can be modified. Camping sites used in conjunction with mineral exploration or extraction operations are expected to be kept in a neat and orderly condition. If operations cannot be pursued due to high fire danger in forested areas, then living on the claim site will not be permitted. Any occupancy beyond 90 days must be in accordance with the requirements of the County Planning Department.

Security Guard

In some cases, it may be reasonably incident for a security guard to live on site in order to protect valuable property, equipment, or workings which are necessary for the mining operation, or to protect the public from site hazards. The need for a security guard shall be such that the person with those duties is required to be present at the site whenever the operation is shut down temporarily or at the end of the workday, or whenever the mining claimant, operator, or workers are not present on the site. The proposed occupancy by a security guard must be described in the Notice or Plan of Operations.

Reclamation

Reclamation of all disturbed areas must be performed concurrently or as soon as possible after exploration or mining ceases and shall conform to the guidelines described in BLM Handbook H-3042-1. Reclamation shall include, but shall not be limited to: 1) saving topsoil for final application after reshaping disturbed areas; 2) measures to control erosion, landslides, and water runoff; 3) measures to isolate, remove or control toxic materials; 4) reshaping the area disturbed, applying topsoil, and revegetating disturbed areas where reasonably practicable; and 5) rehabilitation of fisheries and wildlife habitat. When reclamation of the disturbed area has been completed, except to the extent necessary to preserve evidence of mineralization, the BLM must be notified so that an inspection of the area can be made.

Equipment and Debris

All mining equipment, vehicles, and structures must be removed from the public lands during extended periods of non-operation and/or at the conclusion of mining, unless authorization from BLM is given to the operator or claimant in writing. Accumulations of debris and trash on mining claims are considered unnecessary and undue degradation and must be removed immediately regardless of the status of the operation. Failure to do so will result in the issuance of a notice of noncompliance or a citation under State law.

Backfilling and Re-contouring

The first steps in reclaiming a disturbed site are backfilling excavations and reducing high walls, if feasible. Coarse rock material should be replaced first, followed by medium sized material, with fine materials to be placed on top. Re-contouring means shaping the disturbed area so that it will blend in with the surrounding lands, minimize the possibility of erosion, and facilitate re-vegetation.

Seedbed Preparation

Re-contouring should include preparation of an adequate seedbed. This is accomplished by ripping or disking compacted soils to a depth of at least 6 inches in rocky areas and at least 18 inches in less rocky areas. This should be done following the contour of the land to limit erosion. All stockpiled settling pond fines, and then topsoil, shall be spread evenly over the disturbed areas.



Fertilizer

Due to the generally poor nutrient value of mined soils, it may be necessary to use fertilizer to ensure maximum yield from the seeding mixture. The fertilizer (16-16-16, or other approved mix) should be spread at the rate of 200 lbs/acre, but not allowed to enter streams or bodies of water.

Seeding

BLM approved seeding prescription must be used to provide adequate re-vegetation for erosion control, wildlife habitat, and productive secondary uses of public lands. Seeding should be done in September or October in the Roseburg District to ensure that seed is in the ground prior to the first significant winter rains. If seeding fails, or is done at the wrong time, the operator may be asked to reseed the area at the appropriate time, as determined by the Authorized Officer.

Broadcast seeding is preferable on smaller sites. When using a whirlybird type seed spreader, it is important to keep the different seeds well mixed to achieve even seed distribution. For the best results, a drag harrow should be pulled over the seeded area to cover the seed before mulching. The Authorized Officer may recommend hydro-seeding on critical sites for rapid coverage and erosion control on cutbanks, fill slopes, and any other disturbed areas.

Tree Replacement

Replacement of destroyed trees may be necessary with the planting of seedlings or container stock.

Mulch

As directed by the BLM, during review of the Notice or Plan of Operations, the disturbed area may require mulching during interim or final reclamation procedures. Depending on site conditions, the mulch may need to be punched, netted, or blown on with a tackifier to hold it in place. In some cases, erosion control blankets may be cost effective for use.

Roads

After mining is completed, all new roads shall be reclaimed, unless otherwise specified by the BLM. High walls and cutbanks are to be knocked down or backfilled to blend with the surrounding landscape. All culverts shall be removed from drainage crossings and the fill shall be cut back to the original channel. The roadbed should be ripped to a minimum depth of 18 inches to reduce compaction and provide a good seedbed. The road must then be fertilized, seeded and mulched if necessary. When necessary, water bars are to be used to block access and provide drainage.

Tailings Ponds

The ponds should be allowed to dry out and the sediments removed and spread with the topsoil, unless the sediments contain toxic materials. If the ponds contain toxic materials, a plan will be developed to identify, dispose, and mitigate effects of the toxic materials. If necessary, a monitoring plan will also be implemented. The ponds should then be backfilled and reclaimed.

Visual Resources

To the extent practicable, the reclaimed landscape should have characteristics that approximate or are compatible with the visual quality of the adjacent area.

Guidelines for Development of Salable Mineral Resources

Proposed Operations

All proposed salable mineral developments, and any exploration that involves surface disturbance, should have operation and reclamation plans approved by the Authorized Officer. All proposals will undergo the appropriate level of review and compliance with the National Environmental Policy Act.

Quarry Design

Due to steep terrain in the operating area, most quarry developments would require a series of benches to effectively maximize the amount of mineral materials to be removed in a safe manner. In all cases, bench height shall not exceed 40 feet. If the bench would be used by bulldozers to access other parts of the quarry, the width of the bench should be at least 25 feet. If the bench won't be used by equipment, then this width can be reduced to approximately 10 feet.

Clearing of timber and brush should be planned at least 10 feet beyond the edge of the excavation limit. Most often the brush would be piled and burned at the site, or scattered nearby.

If at all possible, all topsoil and overburden should be stockpiled and saved for eventual quarry site reclamation. These piles may need to be stabilized by mulching or seeding in order to minimize erosion during the winter months.

As a standard procedure, the excavation of the quarry floor should be designed with an out-slope of approximately two percent in order to provide for adequate drainage of the floor. Compliance with this design should be made a requirement of all operators at the site.

Operating Procedures

Where practicable, the following requirements should be made a part of every contract or permit providing for the use of mineral material sites on the district:

Oversized boulders shall not be wasted, but shall be broken and utilized concurrently with the excavated material unless otherwise specified.

The operator shall comply with local and State safety codes covering quarry operations, warning signs and traffic control. All necessary permits must be obtained from State and County agencies.

Use of the site for equipment storage and stockpiling rock material is allowed for the duration of the contract or permit. Use of the site beyond that time would be authorized under a temporary use permit.

All topsoil shall be stockpiled or windrowed as appropriate, for use in reclamation.

Prior to abandonment, all material sites will be graded to conform with the surrounding topography. Topsoil will be utilized to create a medium for re-vegetation. Reseeding and tree planting, if necessary, will be done as prescribed by the Authorized Officer. Access roads no longer needed by the BLM will be abandoned and reclaimed as directed by the Authorized Officer.



Appendix Q. Vegetation Modeling

This appendix provides background on the vegetation modeling used to simulate the application of the land use allocations, management action, and forest development assumptions to characterize forest conditions into the future.

In this appendix:

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BLM Forest Inventory Data 1506

Use of the Inventory Data in the Modeling 1512

GIS – Defining the Land Base & Spatial Projections 1534

Forest Growth and Yield Modeling 1536

OPTIONS Modeling 1552

OPTIONS Products 1588

Introduction

The alternatives eonsidered in the plan revisions outline a range of approaches for managing the BLM forest lands by varying the land alloeations and intensity with whieh these forests are managed. These different management approaehes result in a range of outeomes in terms of the struetural stages of the forest over time, types of habitat whieh are developed, and the sustainable harvest levels. Models allow simulation of the development of the forest over time under these various management strategies. Models were used in the plan revision to simulate the applieation of the land use alloeations, management action, and forest development assumptions to charaeterize forest conditions 10, 20, 50, and 100+ years into the future. The models are also used to determine the level of harvest whieh ean be produeed and sustained over time. The outputs from modeling form a faetual basis for comparing and evaluating these different land management strategies at the strategie policy level.

Two primary vegetation models were used for the plan revisions.

- ORGANON - Individual tree growth model that was utilized for the development of growth and yield projections for the major speeies groups on the BLM lands. ORGANON was developed by Oregon State University. http://www.eof.orst.edu/cof/fr/researeh/ORGANON/
- OPTIONS - Spatially explieit strategie planning model that was utilized to project the forest eonditions over time by simulating the land alloeations and management action of the alternatives. OPTIONS is proprietary software ereated by DR Systems Ine. http://www.drsystemsine.eom/prod_options.html

Both of these models have been in use and under continued development for approximately 20 years, and provide a framework to bring the data and assumptions together to simulate these management seenarios. The extent of this modeling effort when looked at from an entire plan revision perspeetive ean seem large and eomplex. It is easier to understand the modeling by looking at the major eomponents used in the model formulation. These major eomponents inelude; the GIS data which defines the land alloeations and spatial representation of numerous resourees, the forest inventory data, growth and yield projections, the definitions of habitats and struetural stages, the assumptions on habitat and struetural stage development, and management assumptions to simulate the alternatives.

This appendix provides an overview of the key components that were used in formulating the models used in the plan revision.

1. BLM Forest Inventory
2. Use of Inventory Data in Modeling
3. GIS – Defining the Land Base and Spatial Projections
4. Forest Growth and Yield Modeling
5. OPTIONS Modeling
6. OPTIONS Products

BLM Forest Inventory Data

Introduction

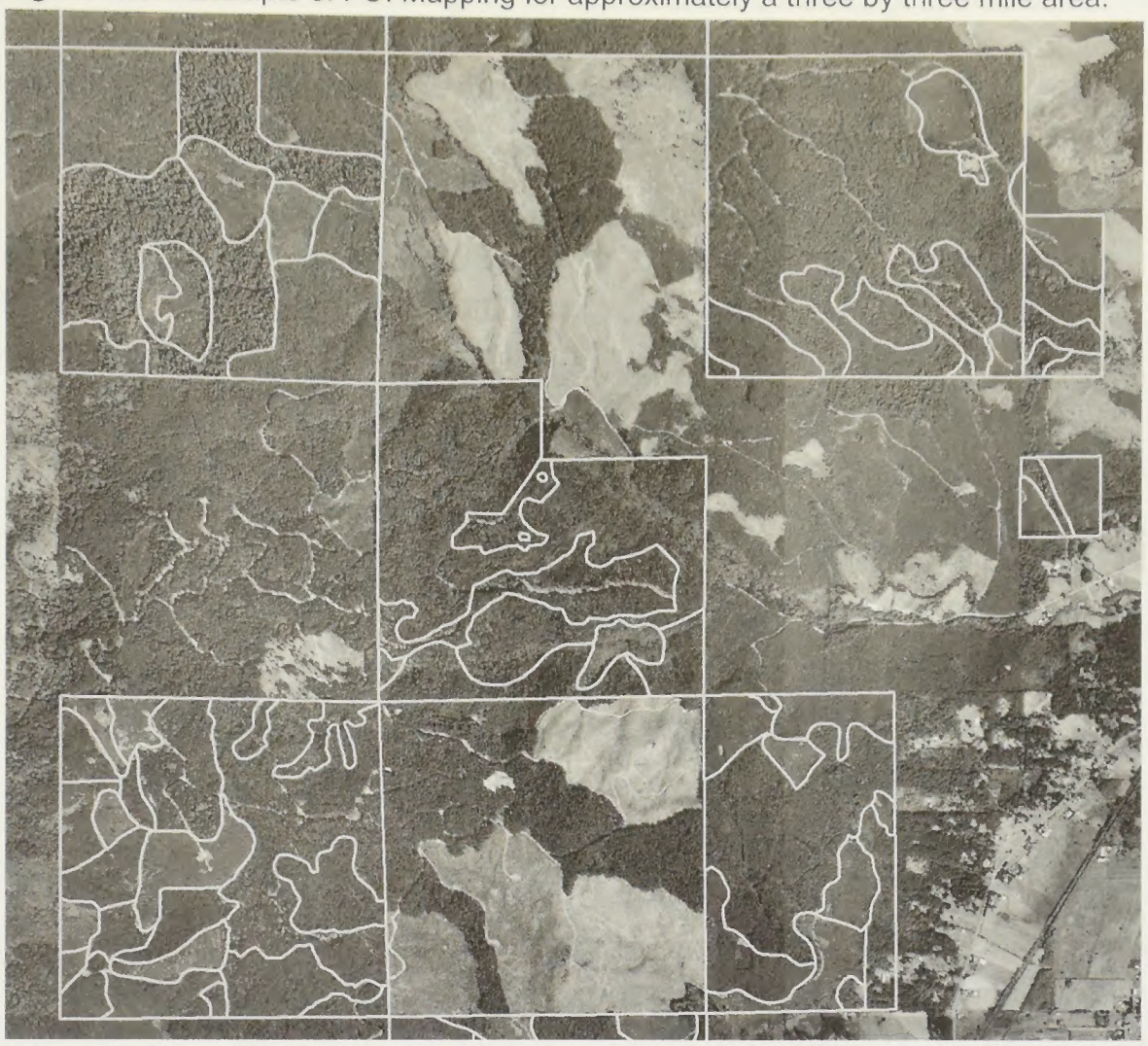
Three inventories of the BLM lands were used in the vegetation modeling for the plan revision.

- GIS Vegetation mapping with stand level attributes.
- Timber Productivity Capability Classification (TPCC)
- Current Vegetation Survey (CVS) – measured permanent plot data.

GIS Vegetation Mapping – Forest Operations Inventory & Micro*Storms

The Forest Operations Inventory (FOI) is a GIS layer which delineates vegetation polygons across BLM lands within the planning area. There are approximately 80,000 stands identified that average 32 acres in size. The minimum mapping feature is generally five acres but some finer scale non forest and harvest features are identified. Polygons are delineated based on vegetation attributes of cover condition, size class, density of trees, and age.

Figure 329. Example of FOI Mapping for approximately a three by three mile area.



The Micro*Storms database contains the attributes for the FOI polygons. The vegetation classification represents stand average characteristics which include:

- Cover Condition – Conifer, hardwood, mixed, or non forest.
- Single or Multi canopy stands.
- Species – Top 5 species with percent occupancy within a stand layer and listing of other species present.
- Stocking Class.
- Size Class – Diameter of the trees species by layer in 10" diameter classes.
- Birthdate of the layer.
- Ten year age class.

Land management treatment history is recorded in Micro*Storms for the FOI polygons. These treatments include; timber harvest, site preparation, planting, stand maintenance / protection, pre-commercial thinning, fertilization, pruning and a variety of other treatments.

The data is updated by the districts on a regular basis as treatments are implemented and as conditions change. The data is updated by a variety of inventory methods. The FOI and its companion database, Micro*Storms, are operational datasets that are in daily use by the districts for planning and tracking purposes.

The FOI and Micro*Storms data, as used in the plan revision, reflects the conditions of the BLM lands as of October 2005. The FOI data is the spatial representation of the forest conditions for the OPTIONS vegetation modeling. The Micro*Storms data was used to develop modeling stratification for: species groups, site productivity, existing stand conditions, and 10 year age class.

Timber Productivity Capability Classification

The Timber Productivity Capability Classification (TPCC) is a classification of BLM lands based on the physical and biological capability of the site to support and produce commercial forest products on a sustained yield basis. Each TPCC unit is classified based on four assessments.

1) Forest / Non Forest

- ***Forest*** - capable of 10% tree stocking
- ***Non forest***

2) Commercial Forest Lands

- ***Commercial forest lands*** - capable of producing 20 cubic feet of wood per year of commercial species.
- ***Non commercial forest lands*** – not capable of producing 20 cubic feet of wood per year of commercial species.
- ***Sui Woodland*** – Non Commercial Species or Low Site

3) Fragile Conditions

- ***Non Fragile*** – forest yield productivity is not expected to be reduced due to soil erosion, mass wasting, reduction in nutrient levels, reduction in moisture supplying capacity, and or the rise of ground water .
- ***Fragile*** - forest yield productivity may be expected to be reduced by soil erosion, mass wasting, reduction in nutrient levels, reduction in moisture supplying capacity, and or the rise of ground water table.

Fragile sites are classified as:

- ***Restricted*** – Special harvest and or restricted measures are required.

- ***Non Suitable Woodland*** – Future production will be reduced even if special harvest and or restricted measures are applied due to the inherent site factors. These lands are not biologically and or environmentally capable of supporting a sustained yield of forest products.

4) Reforestation

Reforestation problem sites are those where environmental, physical, and biological factors have the potential to reduce the survival and or growth of commercial tree seedlings. These factors include light, temperature, moisture, frost, surface rock, animals and disease.

- ***Non Problem*** – Sites that can be stocked to meet or exceed target stocking levels, of commercial species, within 5 years of harvest, using standard practices.
- ***Restricted*** – Commercial forest land where operational reforestation practices in addition to standard practices are necessary to meet or exceed the minimum stocking levels of commercial species within 5 years of harvest.
- ***Suitable Woodland*** - Operational practices will not meet or exceed minimum stocking levels of commercial species within 5 years of harvest. These sites are biologically capable of producing a sustained yield of timber products.

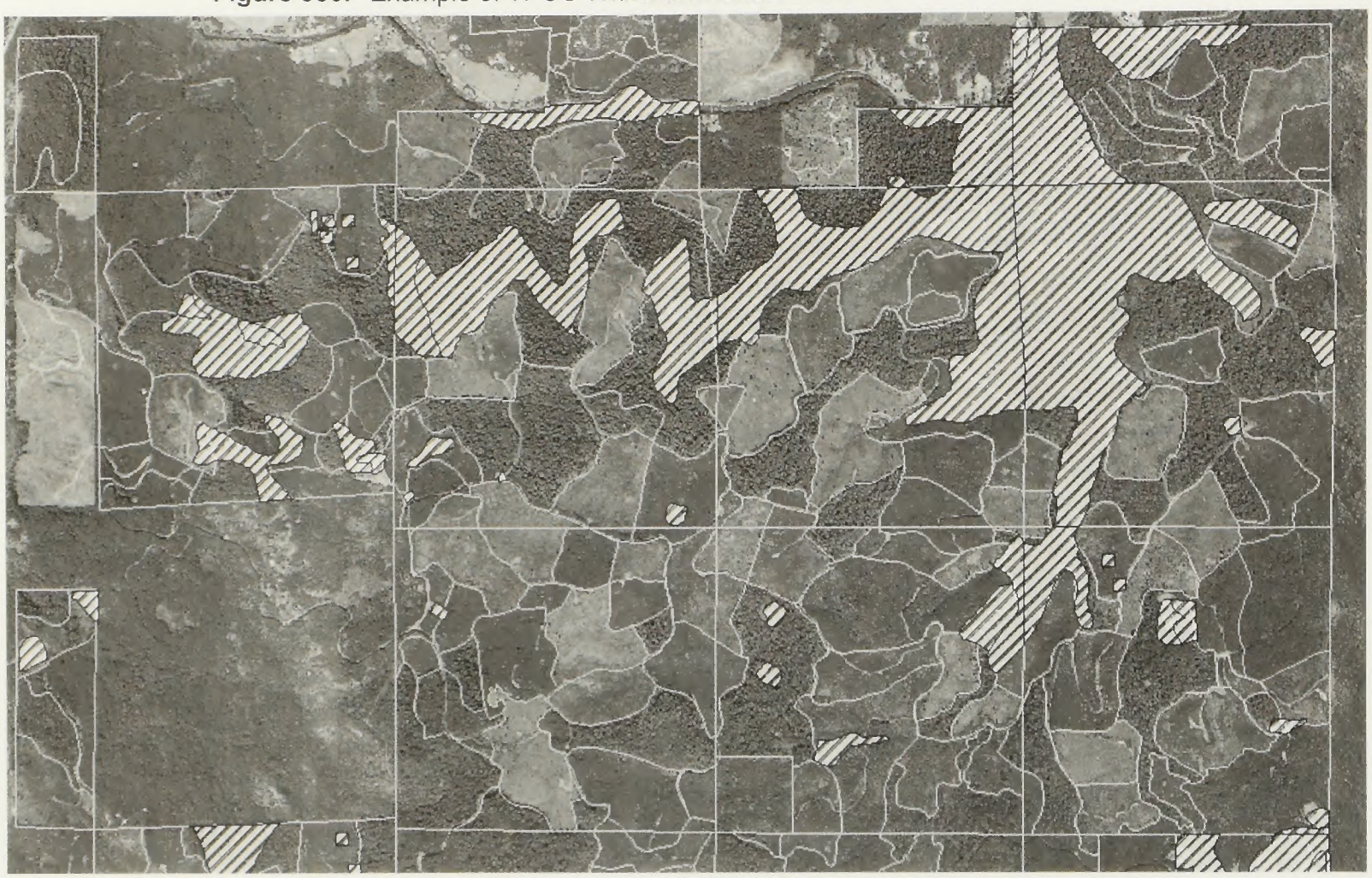
BLM handbook 5251-1 (1986) provides the standards for the TPCC Classification.

There are approximately 66,000 TPCC units mapped in GIS on the BLM lands within the planning area. The minimum mapping feature is generally five acres but some finer scale non forest features are identified in the data. The TPCC initial classification of all BLM lands in the planning area was performed in the late 1980s. The data is updated on an as needed basis as lands are acquired, and new information is obtained through field examination.

The data, as used in the plan revision, reflects the classification of the BLM lands as of October 2005. For the Western Oregon Plan Revision the TPCC data is used to identify what portions of the BLM lands will contribute to the Allowable Sale Quantity. The non forest, suitable woodlands, and non suitable woodland categories are not included in the lands contributing to the Allowable Sale Quantity under the current plan.

In the graphic below the cross hatched areas are examples of TPCC units withdrawn from the lands contributing to the Allowable Sale Quantity. The Forest Operations Inventory units are outlined for approximately a four by two mile area.

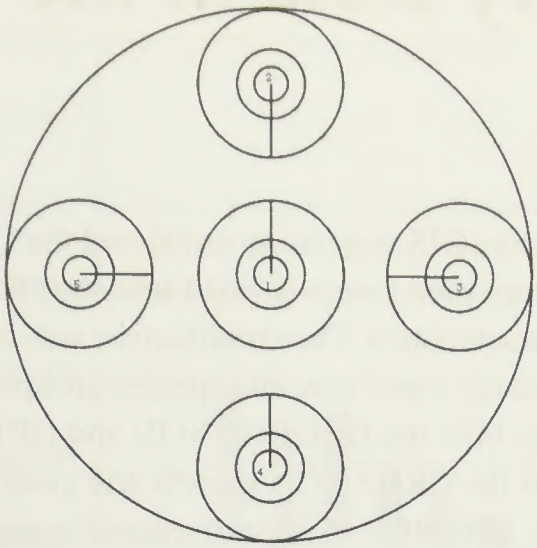
Figure 330. Example of TPCC Withdrawn lands.



Current Vegetation Survey - Measured Plot Inventory

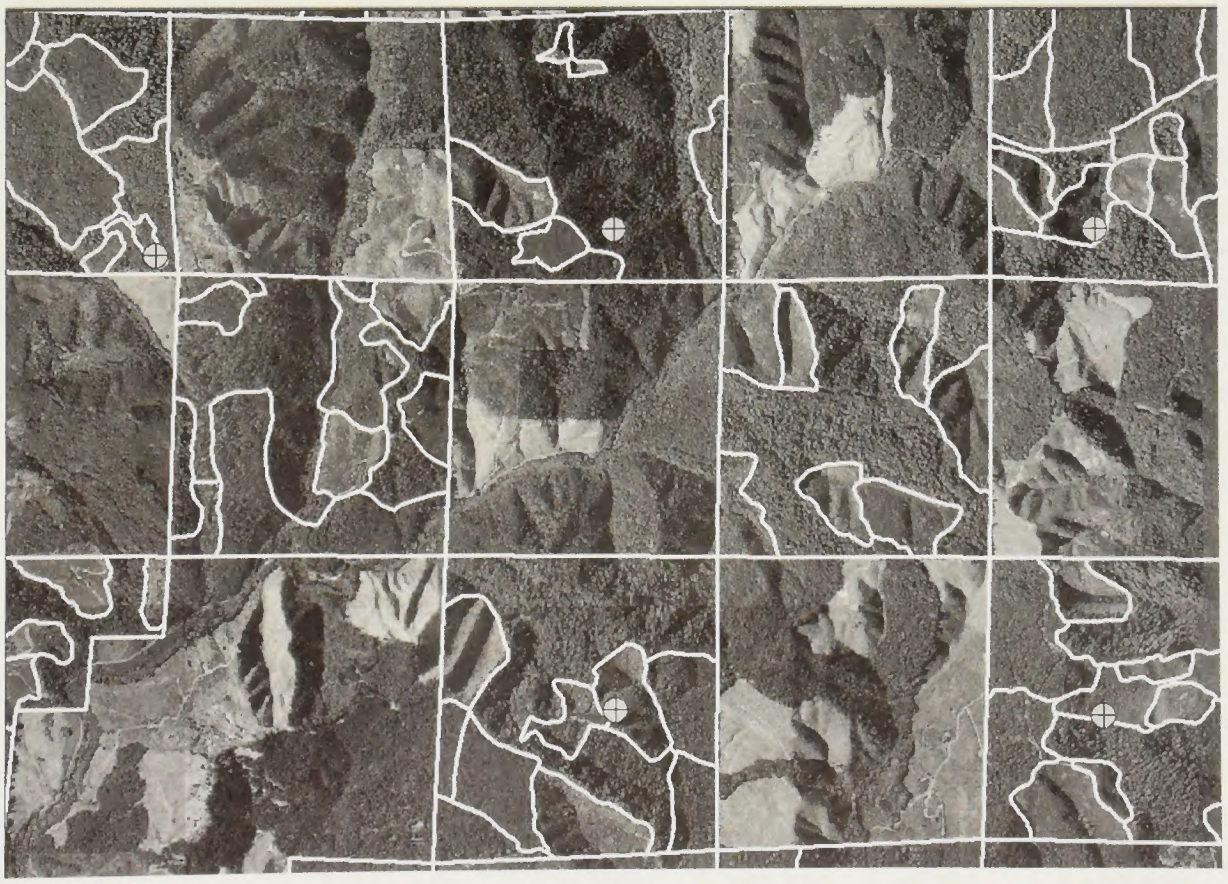
The Current Vegetation Survey (Max, T.A. et al. 1996) provides comprehensive information on vegetative resources on BLM lands within western Oregon. The information was collected during the years 1997 to 2001. It consists of four 3.4-mile grids of field plots that are off-set from one another to produce one 1.7 mile grid across BLM lands for a total of 1,376 plots. The primary sampling unit is one hectare (approximately 2.5 acres) with five fixed-radius sets of subplots with trees 1.0 to 2.9 inches DBH measured on the 11.8 foot radius subplot, 3.0 to 12.9 on a 24.0 foot, 13.0 to 47.9 on a 51.1 foot and trees 48.0 and larger on the 1/5 hectare (approximately ½ acres) nested subplots. There is one subplot located at the plot center and four subplots each in a cardinal direction and 133.9 feet from the center of the plot (See Figure 331). In addition, at each subplot potential natural vegetation is determined using plant indicator keys, and coarse woody debris is measured along a transect. For specific information on the attributes that are collected refer to USDI BLM 2001).

Figure 331. CVS Plot Design



The location of most of the plot centers have differentially corrected GPS coordinates. Since each subplot center was located at a precise distance from the plot center, the coordinates for the subplot centers were calculated and included in a GIS layer. The CVS layer was overlain on the Forest Operation Inventory GIS map. The CVS layer is independent of the FOI layer; consequently, the CVS data represents an unbiased sampling of the FOI layer. In the graphic below the cross hair dot symbols are examples of CVS plot center locations on a 1.7 mile grid. The Forest Operations Inventory units are outlined for approximately a four and half by three mile area.

Figure 332. CVS Plot overlain with Forest Operations Inventory.



Use of the Inventory Data in the Modeling

Introduction

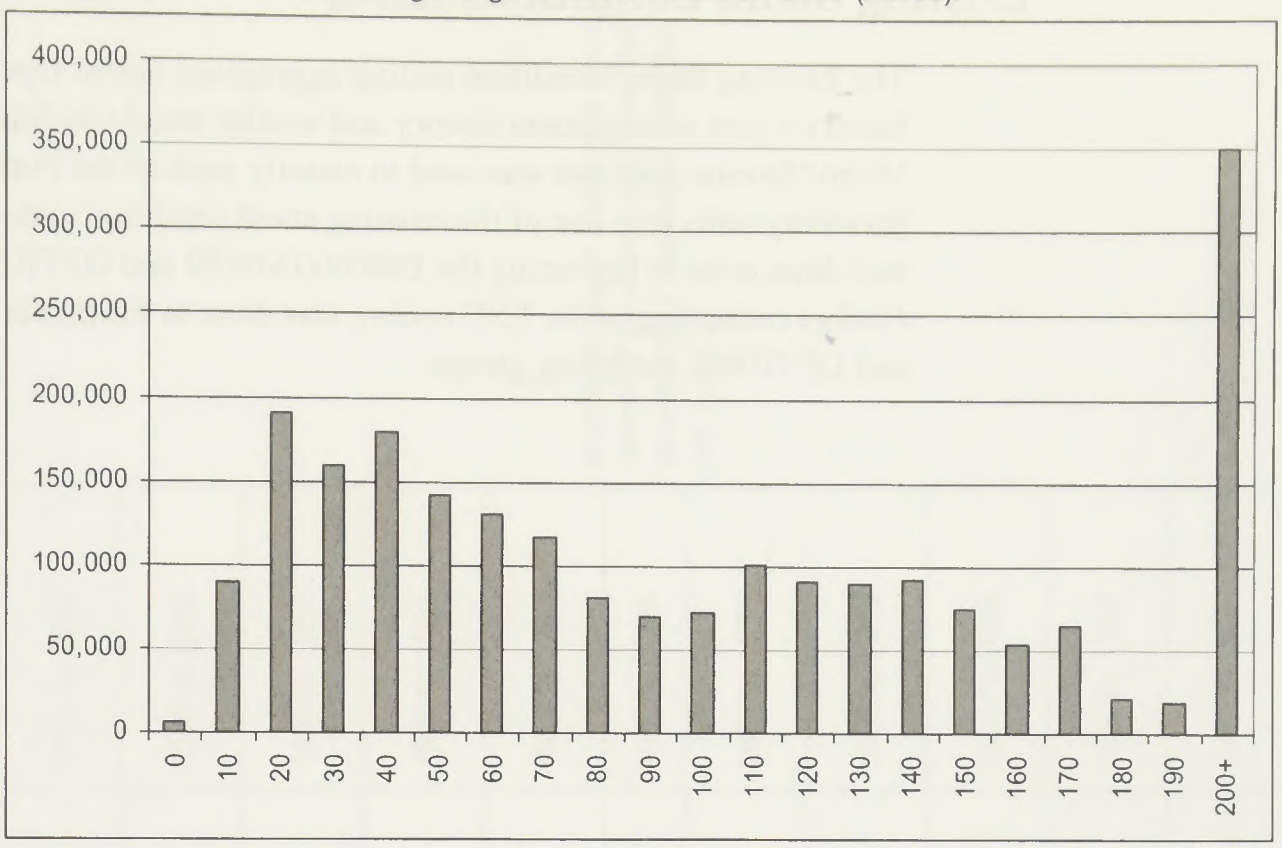
The Forest Operations Inventory (GIS vegetation units) and the Current Vegetation Survey data (measured inventory plots) were divided into stratification units to identify groups of stands with like characteristics. The stratification was based upon Existing Stand Conditions (ESC), site class, stand age, and species groups. This stratification of the data carried forward into both the DBORGANON and OPTIONS modeling. DBORGANON is a version of the ORGANON growth and yield model customized for BLM by FORsight Resources. DBORGANON is discussed in more detail in the Growth and Yield section of this appendix.

Stratification of Forest Operation Inventory

Stand Age

For every Forest Operations Inventory unit there is a stand age recorded in the Micro*Storms database. The stand ages reflect the conditions of the forest as of 2006 A ten year age class was derived from these stand ages which served as the starting ages for the OPTIONS model. For multi storied stands the ten year age class was assigned to the predominant layer that is being managed. Stand ages over 200 years of age are in 50 year bands. All regeneration harvest timber sales sold by September 30th, 2005 were considered depleted from the inventory and the stand ages were converted to year zero for OPTIONS modeling. Stand ages were not assigned to the Klamath Falls eastside management lands. Update instructions for the Forest Operations Inventory were issued to the districts through BLM Information Bulletin No. OR-2005–142 http://web.or.blm.gov/records/ib/2005/ib-or-2005-142.pdf

Figure 333. Western Oregon Age Class Distribution 2006 (Acres).



Western Oregon Age Class Distribution 2006 by Sustained Yield Unit (Acres)

Age Class	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath	Total
0	273	110	1,374	1,311	3,654	0	6,722
10	13,172	12,108	23,079	16,176	24,742	969	90,247
20	32,098	30,163	37,483	31,292	56,403	3,483	190,922
30	34,395	31,666	39,203	32,757	20,328	1,595	159,944
40	35,946	32,071	32,483	37,476	38,329	2,578	178,883
50	23,067	27,581	29,673	28,794	30,865	1,731	141,710
60	41,409	41,547	13,198	12,676	20,213	1,913	130,956
70	30,922	29,659	8,997	15,946	28,680	2,699	116,902
80	22,908	12,567	5,387	9,272	26,627	3,905	80,667
90	13,738	6,701	5,584	3,519	35,325	5,365	70,232
100	12,047	4,423	5,607	4,161	42,860	3,421	72,519
110	12,393	6,021	12,661	3,576	62,101	4,216	100,968
120	20,751	7,949	6,573	9,223	44,948	1,908	91,353
130	20,598	6,204	7,679	10,557	43,225	1,048	89,311
140	9,165	1,623	11,233	5,528	62,066	2,797	92,412
150	7,502	1,223	25,360	8,570	30,226	2,046	74,927
160	1,876	2,073	2,310	7,321	39,218	455	53,253
170	2,756	400	8,285	3,810	49,008	396	64,655
180	429	424	1,552	635	17,796	70	20,906
190	201	3,952	2,497	1,739	9,969	92	18,450
200+	29,625	37,571	118,961	57,372	101,156	6,056	350,740
Total	365,272	296,036	399,180	301,710	787,740	46,742	2,196,679

Existing Stand Conditions (ESC)

The Existing Stand Condition coding aggregated Forest Operations inventory based on past management history and similar stand conditions. The Micro*Storms database was used to classify each of the Forest Operations Inventory units into one of the existing stand condition codes. This stratification was done prior to beginning the DBORGANON and OPTIONS modeling. Further collapsing of the ESC coding was done to formulate the DBORGANON and OPTIONS modeling groups.

PROPOSED Existing Stand Condition (ESC) Codes - WOPR					REVISED as of 11/13/2005	
2005 ESC Code	1994 ESC Code	Description	Genetic Improved	Fertilized	Era Stand Created/ Treated	Remarks
1	1	GFMA target stocking (>= 80%) & 250 to 400 TPA density (unimproved TI)			1950 to 1995	
2	6	GFMA target stocking (>= 80%) & 250 to 400 TPA density (unimproved TI) FERTILIZED		X	1950 to 1995	
3	2	GFMA minimum stocking (60-79%) - 150 to 249 TPA density (unimproved TI)			1950 to 1995	
4	6	GFMA minimum stocking (60-79%) - 150 to 249 TPA density (unimproved TI) FERTILIZED		X	1950 to 1995	
5	3	GFMA below minimum stocking (< 60%) - 50 to 149 TPA density (unimproved TI)			1950 to 1995	previously regen harvested without retention trees including pre-RMP stands with 2 dispersed retention trees per acre
6	4	GFMA Overstocked/overdense - > 400 TPA density (unimproved TI)			1950 to 1995	
7	5	GFMA target stocking (>= 80%) & 250 to 400 TPA density (TI genetic stock)	X		1950 to 1995	
8	6	GFMA target stocking (>= 80%) & 250 to 400 TPA density (TI genetic stock) FERTILIZED	X	X	1950 to 1995	
9	5	GFMA minimum stocking (60-79%) - 150 to 250 TPA density (TI genetic stock)	X		1950 to 1995	
10	6	GFMA minimum stocking (60-79%) - 150 to 250 TPA density (TI genetic stock) FERTILIZED	X	X	1950 to 1995	
11	5	GFMA below minimum stocking (< 60%) - 50 to 149 TPA density (TI genetic stock)	X		1950 to 1995	

PROPOSED Existing Stand Condition (ESC) Codes - WOPR					REVISED as of 11/13/2005	
2005 ESC Code	1994 ESC Code	Description	Genetic Improved	Fertilized	Era Stand Created/ Treated	Remarks
13	n/a	6-8 retention trees - at GFMA target stocking & density (TI genetic stock)	X		1996 to 2005	previously regen harvested with low (6-8 TPA) retention trees level
14	n/a	6-8 retention trees - at GFMA minimum stocking & density (TI genetic stock)	X		1996 to 2005	
15	n/a	6-8 retention trees - below GFMA minimum stocking & density (TI genetic stock)	X		1996 to 2005	
16	n/a	6-8 retention trees - Overstocked GFMA standard- need PCT (TI genetic stock)	X		1996 to 2005	
17	n/a	6-8 retention trees - at GFMA target stocking & density (unimproved stock TI)			1996 to 2005	
18	n/a	6-8 retention trees - at GFMA minimum stocking & density (unimproved stock TI)			1996 to 2005	
19	n/a	6-8 retention trees - below GFMA minimum stocking & density (unimproved stock TI)			1996 to 2005	
20	n/a	6-8 retention trees - overstocked GFMA standard- need PCT (unimproved stock)			1996 to 2005	
21	n/a	12-18 retention trees - at GFMA target stocking & density (TI genetic stock)	X		1996 to 2005	previously regen harvested with moderate (12-18 TPA) retention trees level
22	n/a	12-18 retention trees - at GFMA minimum stocking & density (TI genetic stock)	X		1996 to 2005	
23	n/a	12-18 retention trees - below GFMA minimum stocking & density (TI genetic stock)	X		1996 to 2005	

PROPOSED Existing Stand Condition (ESC) Codes - WOPR					REVISED as of 11/13/2005	
2005 ESC Code	1994 ESC Code	Description	Genetic Improved	Fertilized	Era Stand Created/ Treated	Remarks
25	n/a	12-18 retention trees - at GFMA target stocking & density (unimproved stock TI)			1996 to 2005	previously regen harvested with moderate (12-18 TPA) retention trees level
26	n/a	12-18 retention trees - at GFMA minimum stocking & density (unimproved stock TI)			1996 to 2005	
27	n/a	12-18 retention trees - below GFMA minimum stocking & density (unimproved stock TI)			1996 to 2005	
28	n/a	12-18 retention trees - overstocked GFMA standard- need PCT (unimproved stock TI)			1996 to 2005	
30	n/a	Density Mgt at age class 30			1996 to 2005	low/variable residual density commercial thinnings (immediate post-thin Curtis RD < 35)
31	n/a	Density Mgt at age class 40			1996 to 2005	
32	n/a	Density Mgt at age class 50			1996 to 2005	
33	n/a	Density Mgt at age class 60			1996 to 2005	
34	n/a	Density Mgt at age class 70			1996 to 2005	
35	n/a	Density Mgt at age class 80			1996 to 2005	
36	n/a	Density Mgt at age class 90 Plus			1996 to 2005	

PROPOSED Existing Stand Condition (ESC) Codes - WOPR					REVISED as of 11/13/2005	
2005 ESC Code	1994 ESC Code	Description	Genetic Improved	Fertilized	Era Stand Created/ Treated	Remarks
37	10	CTed at age class 30			1950 to 2005	moderate/high residual density commercial thinnings (immediate post-thin Curtis RD > 35)
38	11	CTed & fertilized at age class 30		X	1950 to 2005	
39	12	CTed at age class 40			1950 to 2005	
40	13	CTed & fertilized at age class 40		X	1950 to 2005	
41	14	CTed at age class 50			1950 to 2005	
42	15	CTed & fertilized at age class 50		X	1950 to 2005	
43	16	CTed at age class 60			1950 to 2005	
44	17	CTed & fertilized at age class 60		X	1950 to 2005	
46	19	CTed & fertilized at age class 70		X	1950 to 2005	
47	20	CTed at age class 80			1950 to 2005	
48	22	CTed at age class 90			1950 to 2005	
49	n/a	CTed at age class 100			1950 to 2005	
50	n/a	CTed at age class 110			1950 to 2005	moderate/high residual density commercial thinnings (immediate post-thin Curtis RD > 35)
51	30	Mortality Salvaged or Sanitation Cut			Pre-RMP	
52	40	56 to 500 years-old, no past silvicultural treatment			< 1950	unmanaged stands created prior to 1950
53	50	Brushfield, hardwood, noncommercial conifer or backlog conversion opportunity			Any	
54	60	Sold but not cut - regeneration harvest			Any	includes all unharvested litigated & unawarded sales
55	61	Cut, needs site preparation			Any	
56	62	Site prepped, needs regeneration			Any	
57	99	Nonforest			Any	

PROPOSED Existing Stand Condition (ESC) Codes - WOPR					REVISED as of 11/13/2005	
2005 ESC Code	1994 ESC Code	Description	Genetic Improved	Fertilized	Era Stand Created/ Treated	Remarks
58	n/a	> 18/15 retention trees/acre - at GFMA target stocking & density (TI genetic stock)	X		1950 to 2005	
59	n/a	> 18 /15 retention trees/acre - at GFMA minimum stocking & density (TI genetic stock)	X		1950 to 2005	
60	n/a	> 18/ 15 retention trees/acre - below GFMA minimum stocking & density (TI genetic stock)	X		1950 to 2005	Non SW Oregon - previously regen harvested with high (19-25 TPA) retention trees level SW Oregon - previously regen harvested with high (16-25 TPA) retention trees level
61	n/a	> 18 /15 retention trees/acre - Overstocked GFMA standard- need PCT (TI genetic stock)	X		1950 to 2005	
62	n/a	> 18 /15 retention trees/acre - at GFMA target stocking & density (unimproved stock TI)			1950 to 2005	
63	n/a	> 18 /15 retention trees/acre - at GFMA minimum stocking & density (unimproved stock TI)			1950 to 2005	Non SW Oregon - previously regen harvested with high (19-25 TPA) retention trees level SW Oregon - previously regen harvested with high (16-25 TPA) retention trees level
64	n/a	> 18 /15retention trees/acre - below GFMA minimum stocking & density (unimproved stock TI)			1950 to 2005	
65	n/a	> 18 /15 retention trees/acre - overstocked GFMA standard- need PCT (unimproved stock TI)			1950 to 2005	
66	80	Hardwood-Suitable Woodland CFL			Any	Woodland
67	81	Conifer-Suitable Woodland CFL			Any	
68	85	Hardwood-NonSuitable Woodland CFL			Any	

PROPOSED Existing Stand Condition (ESC) Codes - WOPR					REVISED as of 11/13/2005	
2005 ESC Code	1994 ESC Code	Description	Genetic Improved	Fertilized	Era Stand Created/ Treated	Remarks
69	86	Conifer-NonSuitable Woodland CFL			Any	
70	89	Hardwood-Suitable Woodland NonCFL			Any	
71	90	Conifer-Suitable Woodland NonCFL			Any	
72	n/a	GFMA target stocking (>= 80%) & 250 to 400 TPA density (unimproved TI) PRUNED			1950 to 1995	previously regen harvested without retention trees including pre-RMP stands with 2 dispersed retention trees per acre PRUNED for wood quality only
73	n/a	GFMA target stocking (>= 80%) & 250 to 400 TPA density (unimproved TI) FERTILIZED PRUNED		X	1950 to 1995	
74	n/a	GFMA minimum stocking (60-79%) - 150 to 249 TPA density (unimproved TI) PRUNED			1950 to 1995	
75	n/a	GFMA minimum stocking (60-79%) - 150 to 249 TPA density (unimproved TI) FERTILIZED PRUNED		X	1950 to 1995	
77	n/a	GFMA target stocking (>= 80%) & 250 to 400 TPA density (TI genetic stock) FERTILIZED PRUNED	X	X	1950 to 1995	previously regen harvested without retention trees including pre-RMP stands with 2 dispersed retention trees per acre PRUNED for wood quality only
78	n/a	GFMA minimum stocking (60-79%) - 150 to 250 TPA density (TI genetic stock) PRUNED	X		1950 to 1995	
79	n/a	GFMA minimum stocking (60-79%) - 150 to 250 TPA density (TI genetic stock) FERTILIZED PRUNED	X	X	1950 to 1995	
		Medford and Klamath Falls common codes from 1994 PRMP & Proposed ESC for Southern GFMA				
		Woodland codes may be applicable to all districts				

No Action Alternative Exsiting Stand Condtion Acres by Sustained Yield Unit

ESC	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath	E. Mgt. Lands	Grand Total
1	83,348	60,695	57,832	31,920	92,475	6,635	398	333,303
2	14,241	11,706	32,549	29,367	9,614			97,476
3	30,299	31,441	28,320	29,331	18,634			138,026
4	1,662	6,464	6,502	16,663	5,269			36,559
5	2,004	222	644	8,383	6,012			17,266
6	14,057	1,269	23,182	6,899	1,811			47,218
7	4,034	13,481	2,158	6,615				26,288
8	338			487	2,037			2,862
9	1,132	231	870	4,576	539			7,348
10	18			380	15			413
11	43	314	1,023	910	211			2,501
12	2,789		1,346	3,443				7,578
13	512	1,983	342	153				2,989
14	13		154					167
16	672		557	778				2,007
17	200		1,135	157	12,178			13,670
18	37		152	20	5,717	19		5,946
19			19		2,254			2,273
20	275		218	424				917
21	62	430						491
22	250							250
24	86		37					123
25	18		19		617	189	2,750	3,592
26	3				225			228
27					77			77
28	46		212					258
30				908	7	683		1,598
31		72	201	1,853	206	2,214		4,547
32	39	676	507	1,139	229	1,437	112	4,138
33	1,123	990	845	809	149	1,362	782	6,059
34	297	754	102	316	839	2,384	629	5,321
35				330	822	3,485	1,183	5,820
36	49			148	9,473	18,482	9,811	37,962
37	458	52	159	313	105			1,087
38	35			131	98			264
39	3,277	851	2,218	992	145			7,483
40	16	283		956				1,255
41	8,935	4,163	3,154	1,919	238			18,408
42	1,766	856	9	2,633				5,265
43	8,201	5,683	2,023	843	204			16,955
44	824	1,049		831				2,704
45	5,674	2,778	1,438		876			10,765
46	354	445	121					919
47	8,252	519	595	120	993			10,480
48	6,643	247	156	6	1,166			8,218
49	824	37	32		2,732			3,624
50	779		170	36	6,793			7,778
51		888	5,330	125	20,481	4,546		31,370
52	186,872	154,570	224,927	144,923	376,391	1,445	171	1,089,298
53		5,248	2,659	8,598	5,906	676	1,265	24,351
54	147		548	909	1,320			2,924
55	133	71		307				511
56		30	249	167				446
57	10,500	2,790	7,711	4,499	42,014	2,131	74,399	144,045
62					53			53
64					79			79
66					2,353			2,353
67					67,045	152	24	67,221
68			5,661		715	62		6,439
69		7	1,145	1,046	39,161	414	4,289	46,063
70					40,972	947	64	41,984
71					87,314	4,043	77,026	168,383
72	622	939	1,471	754	58			3,845
73	224	25	731	1,117	12			2,109
74			2,206	766	56			3,028
75			1,705	2,242				3,947
76			166	467				633
77				46				46
78				349				349
79			82	65				147
Total	402,184	312,261	423,589	321,167	866,694	51,306	172,903	2,550,103

Species Groups

The Micro*Storms database has a listing of the top 5 species within each stand layer with a ranking of relative abundance. This data was utilized to classify each Forest Operations Inventory Unit into one of the following species groups for modeling purposes. The Micro*Storms species group stratification was a starting point. For the OPTIONS and ORGANON modeling some species groups were combined to attain adequate representation by the Current Vegetation Survey plots.

Douglas-fir (DF)

This species group includes stands with single species DF listed, and those stands with minor quantities of either other conifers or hardwoods. They would typically be "FCO" stands (forest conifer), and have either single or multiple sizes and ages indicated.

Northern True Fir (N_TF)

Stands of Noble or Silver fir, including with other species mixed in such as Douglas-fir, western hemlock, or western redcedar, but where Silver or Noble are dominant.

Northern Mixed Conifer (N_MX_CON)

This species group includes stands with single species of western hemlock, western redcedar, Sitka spruce, or mixed conifer stands where Douglas-fir would not be the dominant species. They would typically be "FCO" stands (forest - conifer).

Northern Conifer / Hardwood Mix (N_CON_HWD)

These stands would have both conifer and hardwood species listed. Neither conifer nor hardwood would dominate these stands. Conifers or hardwoods could be indicated in the dominant or secondary position. Hardwoods would include big leaf maple and red alder mixed with conifer species. Many FMX stands (forest - conifer and hardwoods) would be located here.

Northern Hardwood (N_HWD)

Maple/alder mixes and pure alder are here. Pure or nearly pure alder stands, with limited maple fractions. FHD stand (forest - hardwoods) descriptions are here.

Southern Mixed Conifer (S_MX_CON)

Stands containing incense cedar, sugar pine, Ponderosa pine, Douglas-fir and white fir in varying fractions, but not including pure types without any secondary species indicated. This type may include some hardwood component but less than the southern conifer/hardwood mix. Hardwoods would not be listed as the dominant species.

Southern Conifer / Hardwood Mix. (S_CON_HWD)

This type consists of stands with the mixed conifer species, but with southern hardwoods such as oak, madrone, tanoak, myrtle, etc mixed in. The hardwoods may be in the majority or minority. FMX types (forest - conifer and hardwoods) are here.

Southern Hardwood (S_HWD)

This type consists primarily of southern hardwood species with limited mixed conifer component. Hardwoods would comprise the dominant species, possibly FHD types (forest - conifer and hardwoods).

Southern True fir (S_TF)

Shasta red fir and white fir types would be here. White fir types could have other secondary species such as Douglas-fir.

Ponderosa Pine (PP)

Stands with dominant Ponderosa pine. Stands with Douglas-fir or other species in the understory would be here, if not the dominant species. This would include dryer types with juniper as long as the Ponderosa pine was the dominant species.

Juniper (J)

Types with juniper dominant. This type would contain some with limited pine on dryer lower site types.

Depending on the district and the ORGANON variant used, lodgepole pine and knobcone pine types would go into Northern Mixed Conifer or Southern Mixed Conifer. Jeffery pine would go into a low site Ponderosa pine type. Mountain hemlock would go into northern true fir. Port-Orford-cedar would go into Southern Mixed Conifer.

Figure 334. Species Group by District – Forested Acres

Species Group	Salem	Eugene	Roseburg	Coos Bay	Medford	Kfalls	W. Oregon	
DF	284,856	247,212	300,796	250,087	396,459		1,479,411	64%
N_CON_HWD	54,316	40,127	8,883	27,751			131,076	6%
N_HWD	12,506	4,473	596	5,929			23,504	1%
N_MX_CON	17,163	8,127	327	1,818			27,434	1%
N_TF	9,935						9,935	0%
PP			1,437		57,445	33,544	92,426	4%
S_CON_HWD			28,341	11,206	159,802	2,125	201,474	9%
S_HWD			2,768	2,214	39,740		44,722	2%
S_MX_CON			57,653	734	118,473	29,262	206,122	9%
S_TF					21,170	8,277	29,446	1%
J						71,891	71,891	3%
Total	378,775	299,939	400,802	299,738	793,089	145,098	2,317,442	100%

Site Class

Site Class data in the Micro*Storms database / Forest Operation Inventory (FOI) come from a variety of sources, including estimations, measured on site, and or soils mapping. The site class data in FOI is adequate for a general relative portrayal of productivity but due to the variety of sources it is of varying accuracy.

Site index data was measured on the CVS inventory at the plot level. Assignment of site index to the subplot level was made at the time of data collection. Using a site index conversion routine created by Mark Hanus (FORSight Resources), all measured site data for all species and base ages was converted to a Douglas-fir, 50-year base index, using King (1966) for Northwest Oregon, and Hann-Scrivani (1987) for SW Oregon.

It was assumed that the best representation for range of site productivity values and relative proportions of these values are the CVS data for areas as large as those occupied by combined species group within an SYU. The Measured CVS data was used to re-distribute the FOI site class data to reflect the profile of the measured data. Assignment from the CVS to the FOI was based on a set of rules. These data were apportioned to each sustained yield unit forest land base at the FOI unit level. Existing measured site index data from the Micro*Storms / FOI were retained for individual FOI units. For the remaining FOI units, site productivity values were assigned to all stands in the forest land base in such a manner to approximate the expanded CVS distribution for species groups at the SYU level. These FOI unit-level productivity assignments were held constant for the OPTIONS modeling of all alternatives and sub-alternatives.

Methodology for Site Class Re-Distribution - CVS to the FOI

The following methodology was applied at the district level to achieve a similar distribution of acres by species group and site productivity in the inventory as was present within the CVS information.

Source Information:

A Microsoft Excel spreadsheet, with the following information, was prepared for each district:

- CVS Plot Number – unique plot number
- CVS District – the district for the plot
- CVS Species Group – the super species group for the plot
- CVS Site Productivity – the site productive class for the plot

- FOI Number – unique inventory number
- FOI Site Index Conversion Code – the conversion method used to calculate the Douglas-fir, 50-year base index
- FOI District – the district for the FOI
- FOI Species Group – the super species group for the FOI
- FOI Site Productivity – the site productivity class for the FOI
- FOI Acres – the acres for the FOI
- FOI ORGANON Variant - the ORGANON Variant for the FOI

Assumptions:

A) FOI with measured site index information are not redistributed.

B) FOI polygons are treated as whole units. An FOI polygon can not be split in order to achieve desired acre redistribution.

C) Redistribution of acres can not result in an excess of acres over the desired target.

D) Species Groups identified as 'NF' (non-forest) were not redistributed

E) If either CVS or FOI information was not available, then no redistribution would occur, i.e. both CVS and FOI information must be available for redistribution to occur.

Methodology:

1. Using the source CVS information, for each district (SYU) and species group (SSPG) combination, determine the percent distribution of plots within each site productivity class (SP). For example:

SYU_SSPG	SYU_SSPG_SP	# of Plots in SYU_SSPG	# of Plots in SYU_SSPG_SP	% Distribution
Coos Bay_ NDF	Coos Bay_NDF_1	673	132	20
Coos Bay_ NDF	Coos Bay_NDF_2	673	273	41
Coos Bay_ NDF	Coos Bay_NDF_3	673	182	27
Coos Bay_ NDF	Coos Bay_NDF_4	673	61	9
Coos Bay_ NDF	Coos Bay_NDF_5	673	25	3

2. Using the FOI information, for each district (SYU) and species group (SSPG) combination, determine percent distribution of acres within each site productivity class (SP). For example:

SUY_SSPG	SYU_SSPG_SP	Total Acres in SYU_SSPG	Total Acres in SYU_SSPG_SP	% Distribution
Coos Bay_ NDF	Coos Bay_NDF_1	254347	38372	15
Coos Bay_ NDF	Coos Bay_NDF_2	254347	133575	53
Coos Bay_ NDF	Coos Bay_NDF_3	254347	68960	27
Coos Bay_ NDF	Coos Bay_NDF_4	254347	13440	5
Coos Bay_ NDF	Coos Bay_NDF_5	254347	0	0

3. Redistribute FOI acres between site productivity classes within the district species group to obtain the same percent distribution as indicated by the CVS information. Beginning redistribution starting with the highest site (1) and progress to the lowest site (5) as follows:

    a) Identify initial acres based on FOI information for the desired site productivity class

    b) Determine target acres based on percent distribution from CVS information for the desired site productivity class.

    c) If the initial acres are less then the target acres, then reassign acres from the next lowest site productivity class to the desired site productivity class until the target acres are met (but not exceeded). Acres from each subsequent site productivity class are reassigned until the target acres are achieved.

In our example, for site productivity class 1, the initial 38,372 acres is less than the target acres of 50,869. Therefore, approximately 12,500 acres from productivity class 2 are reassigned to site productivity class 1.

    d) If the initial acres are greater then the target acres, then reassign acres from the current site productivity class to the next successively lower site productivity class until the target is met (but not exceeded).

If our example was reversed and the initial acres for site productivity class were 50,869, then approximately 12,500 acres would be reassigned to site productivity class 2.

SYU_SSPG_SP	Total Acres in SYU_SSPG	Target %	Target Acres	Resulting Redistributed Acres	Resulting Redistributed % Distribution
Coos Bay_NDF_1	254347	0.20	50869	50884	20
Coos Bay_NDF_2	254347	0.41	104282	104224	41
Coos Bay_NDF_3	254347	0.27	68674	68324	27
Coos Bay_NDF_4	254347	0.09	22891	22538	9
Coos Bay_NDF_5	254347	0.03	7630	8376	3

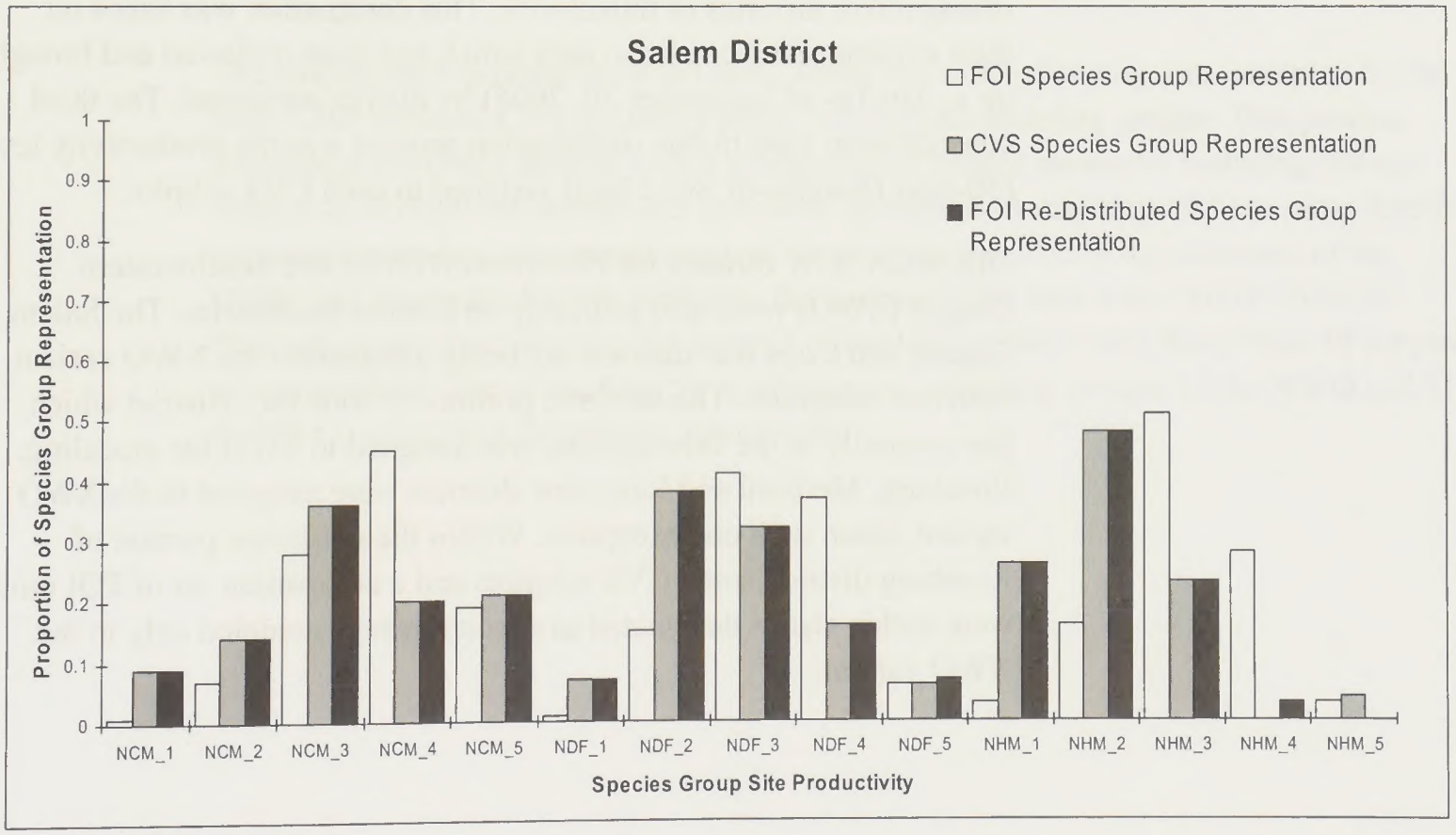
4. For each FOI, reassign the corresponding mid-point site index value based on the new site productivity class and ORGANON variant code.

   1: Southwest Oregon (SWO)

   2: Northwest Oregon (NWO)

Site Productivity Class Midpoints by ORGANON Variant Code	2	1
5	70	60
4	85	75
3	105	95
2	125	115
1	140	130

Figure 335. Salem District Site Class Re-Distribution Example (Species Groups NCM – Northern Conifer Mixed, NDF – Northern Douglas-Fir, NHM – Northern Hardwood Mixed).



Collapsing the Stratification into Modeling Groups

Both the Forest Operation Inventory (FOI) and Current Vegetation Survey (CVS) had an initial stratification based on stand age, existing stand condition (ESC), site productivity class, and species groups. Modeling Groups were developed to aggregate like types which represented significant quantities of the FOI acres and to assure there was sufficient measured data from CVS for each group.

The modeling groups were developed to:

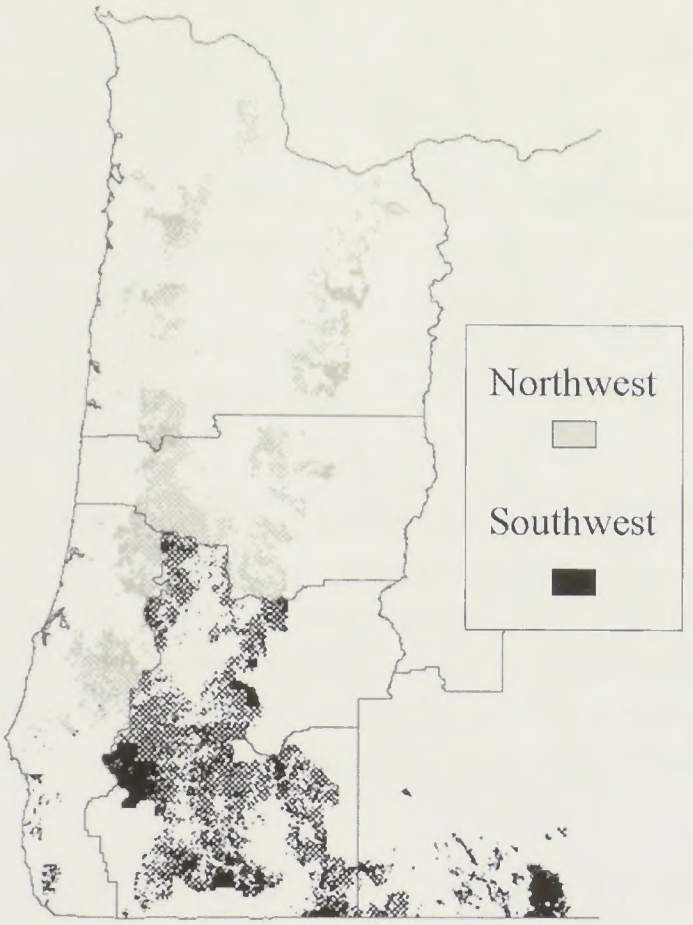
- Classify the CVS data for the development of growth and yield curves with the ORGANON model for each Modeling Group
- Provide a consistent linkage between the growth and yield data from ORGANON with the Forest Operation Inventory (FOI) for configuration, projection and the OPTIONS modeling.

The first step in the process involved grouping the CVS subplots, by ORGANON variant, into strata of similar forest, past treatment, and productivity types. For each CVS subplot, the forest type and past treatment data was extracted from the FOI. The forest type was an assignment of a species group which had been derived by district personnel thru a series of queries on stand level information.

The past treatment groupings consisted of stands with similar management histories or trajectories. This designation was based on their existing stand condition data which had been reviewed and brought up to date (as of September 30, 2005) by district personnel. The third consideration used in this stratification process was the productivity level (50-year Douglas-fir Site Class) assigned to each CVS subplot.

DBORGANON variants for Northwest (NWO) and Southwestern Oregon (SWO) were split primarily on District boundaries. The Salem, Eugene and Coos Bay districts are being assigned to the NWO variant, with one exception. The southern portion of Coos Bay District which lies primarily in the Tanoak Zone was assigned to SWO for modeling. Roseburg, Medford and Lakeview districts were assigned to the SWO variant, again with one exception. Within the northwest portion of Roseburg district, some CVS subplots and a companion set of FOI units were within stands designated as species groups modeled only in the NWO variant.

Figure 336. Organon Variants



The stratification process involved partitioning the entire planning area, sampled by the over 5,300 forested CVS inventory plots, into logical modeling groups. This process involved a multi-day session with a workgroup of district personnel including but not limited to silviculture, timber and inventory specialists. A majority of these same district personnel were in a subsequent stage of the project, involved in development of the Guide and Treatment Curves modeling the grouped CVS data with DBORGANON. Through an iterative process, the number of modeling groups with fewer than 30 subplots was minimized. Out of the final 53 existing-stand modeling groups, 22 for NWO and 31 for SWO, only 2 had fewer than 30 subplots.

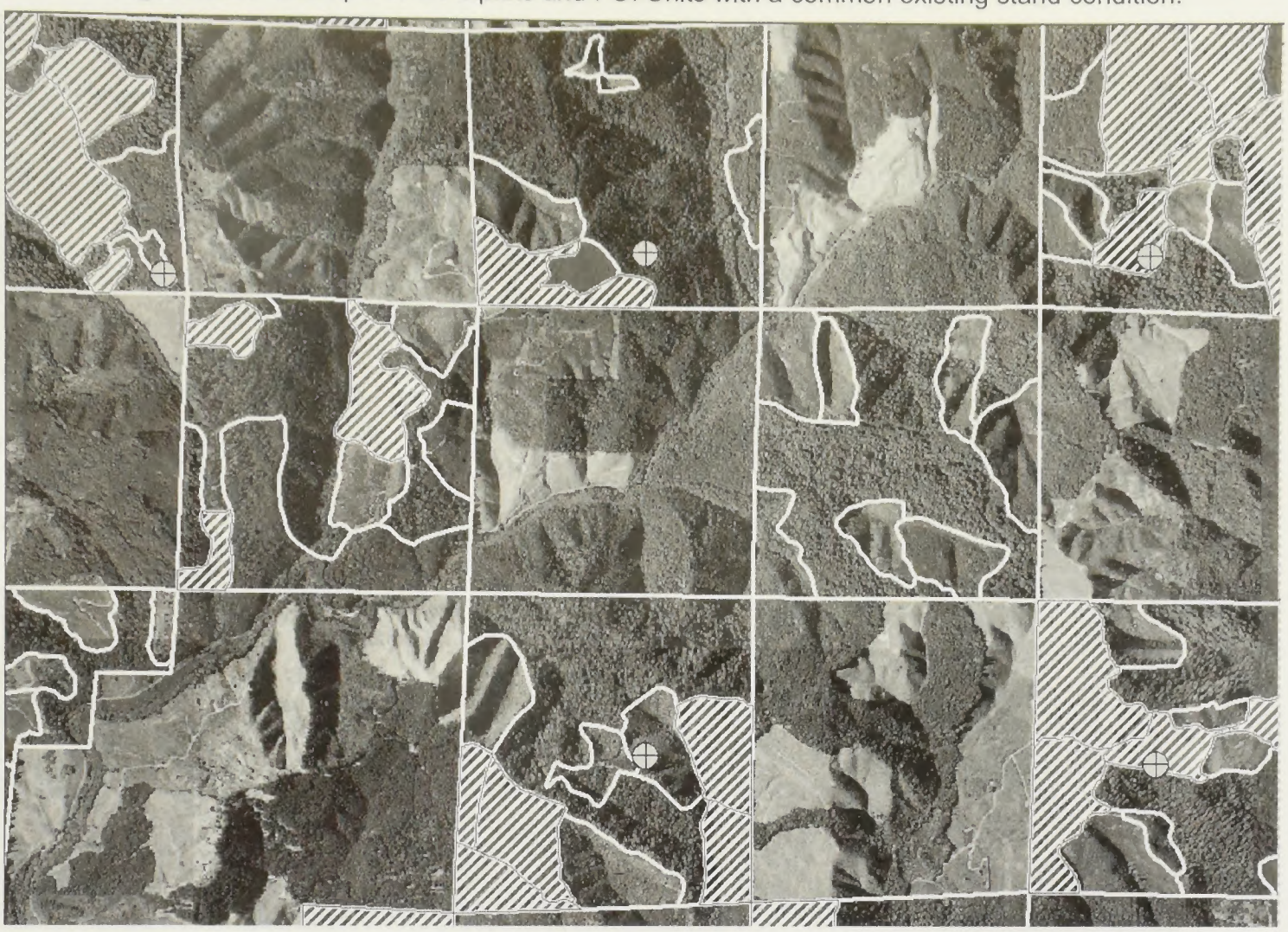
Imputing Data from Current Vegetation Survey (CVS) to the Forest Operation Inventory (FOI)

The objective was to create summary information for each Forest Operation Inventory (FOI) unit within the forested landbase and to mimic the natural variation that exists among the FOI units. There is information to stratify each of the FOI units into Existing Stand Condition (ESC), Site Class, Age and Species Groups. There is CVS data for nearly every combination of characteristics found on BLM lands but there are FOI units without CVS data.

Information from the FOI: Existing Stand Condition (ESC), redistributed site productivity, stand age and species group, were used to stratify both the FOI and CVS. The combination of ESC, site class, age and species groups are non-overlapping strata. The resultant spatial relationship between the CVS plots and the FOI creates a stratified random sample of the plots with unequal number of subplots per plot. The CVS data within each of the characteristic combination represents an unbiased collection of data for that stratum.

In the Figure below, the two plots on the right fall within the selected stratum (cross-hatched). These represent stands with common ESC, site productivity class and species groups.

Figure 337. Example of CVS plots and FOI Units with a common existing stand condition.

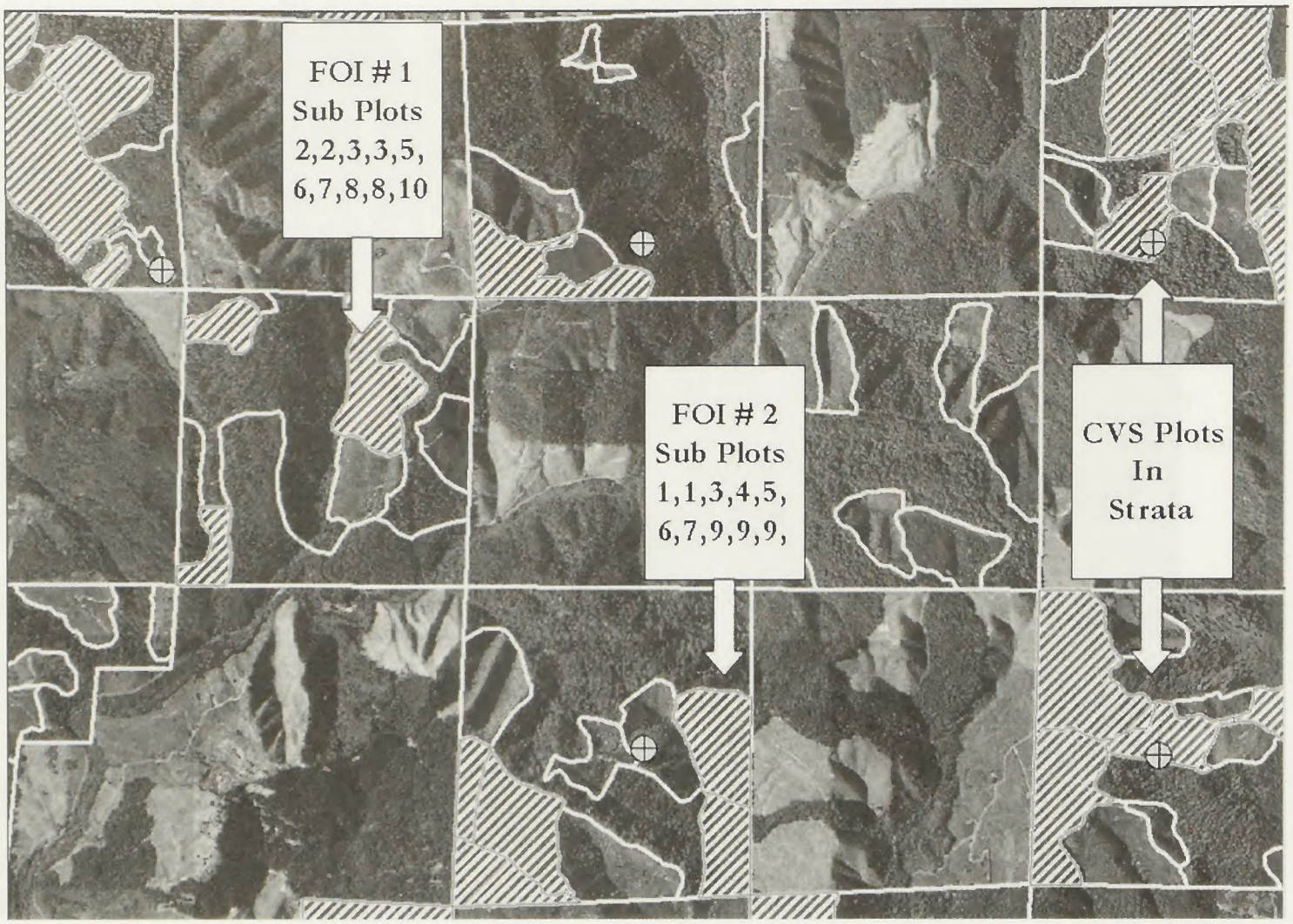


The collection of CVS subplots that fell within the same stratum (defined by ESC, site productivity class and species groups but including different age categories) were projected with no future silvicultural treatments applied. This produced a smooth empirical curve that borrowed strength from adjacent age categories with more data to predict the current inventories for ages with less data.

To derive a set of stand attributes fore each forested FOI unit, the subplots that fell within each stratum (ESC, site class, species group and age) were pooled and the subplots were drawn with replacement equal to the number of subplots within the category. If the number of subplots exceeded 30, then the summary information was calculated using the tree lists associated with each selected subplot and the summary information was assigned to an FOI unit. This process was repeated for each FOI unit within the stratum. This technique imputes values into each FOI unit.

Below is an example of two FOI units that have been assigned 10 subplots with replacement from an original list of subplots numbered from 1 to10.

Figure 338. Examples of subplot data imputed into FOI units



If the number of subplots within a stratum was less than 30, a shrinkage estimate was employed where the predicted attributed associated with the category was combined with the imputed summary statistic and combined estimate was assigned to the FOI unit. The shrinkage estimate can best be illustrated by an example. Say there were 20 CVS subplots within a category, the shrinkage estimate is:

20/30 x CVS statistics + (30-20)/30 x modeled predicted values.

As the number of subplots approach 30, most of the information comes from the CVS data. Conversely if there were relatively few CVS subplots, then the majority of the information came from the ORGANON model. This method was repeated for each FOI unit with the category.

The stratification for the forested FOI units was the basis for applying the CVS derived values for basal area, trees per acre, height, quadratic mean diameter, and board foot volume for the initial inventory in the OPTIONS modeling. The imputed initial inventory dataset provided a consistent basis for the OPTIONS modeling of all alternatives and sub-alternatives.

The use of the imputation provided attributes to the OPTIONS model which did not exist in the Forest Operations Inventory. Attributes assigned through imputation will not match

the characteristics of each individual stand as measured on the ground but the statistics applied to the grouping of stands in the population, is statistically sound. The use of imputation is an attempt to mimic the natural variation that exists among the stands. Although, no process can accurately reflect the actual variation short of conducting a 100 percent cruise, this process is seen as more realistic than assigning the mean value for these statistics to all FOI units within a group.

Application of the Stratification in Growth and Yield Modeling

Each CVS subplot tree list within an existing stand modeling group was projected in the ORGANON growth and yield model individually to simulate future development with and without future silvicultural treatments. Results from the simulations were averaged together to predict stand attributes at any point in time and to define an average yield function. This method is based on the fact that the CVS data represents a random sample of the modeling group hence the average of all projected curves for a modeling group represents the average projection for the FOI units within the modeling group. In OPTIONS terminology these average yield functions are the Guide Curves.

GIS – Defining the Land Base & Spatial Projections

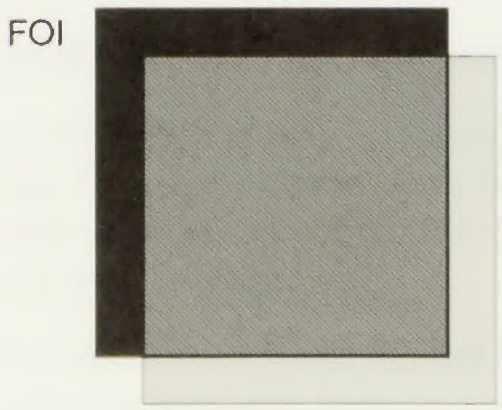
Introduction

The Geographic Information System (GIS) data provides the OPTIONS model with a set of polygons with unique identifiers, covering BLM lands in the planning area. Each of these polygons has attribute data which is used in defining the land base for application of modeling rules for simulation of the alternatives and sub-alternatives. GIS is also used for mapping the OPTIONS projections results of the forest conditions over time. This section provides an overview of the GIS process. The type of GIS data that was used for analyzing the alternatives and how it was applied is covered in the OPTIONS modeling section. Details on the GIS processing and datasets themselves are recorded with the GIS metadata.–

Defining BLM Lands

The land lines theme (LLI) is the BLM corporate GIS layer for land status - O&C, Public Domain, Coos Bay Wagon Road. The Forest Operations Inventory (FOI) is the spatial vegetation layer used for the OPTIONS modeling. The Forest Operations Inventory and Land Lines themes are not vertically integrated in GIS which results in slivering in the areas of misalignment. For the analytical purposes, BLM lands are defined by the area in which the FOI and LLI overlap. This FOI & LLI mask was subsequently used to minimize the slivers from all GIS layers used in the analysis.

Figure 339. Differences between the FOI and LLI themes.



Acres		
FOI & LLI	2,550,000	100.00%
FOI Only	9,200	0.36%
LLI Only	8,200	0.32%

Intersection Versus Majority Rules

Where the subdivision of the FOI was important for simulating different modeling rules within each stand, within, the data layers were intersected in GIS to create unique areas. Riparian reserves and roads are good examples of this within stand subdivision which was important for simulating different modeling rules.

Some data layers came from external sources which were captured at coarser scales than the FOI mapping and do not align well with BLM checkerboard ownership. Northern Spotted Owl Critical Habitat Units is an example of this disparity between GIS data layers. In these situations, a majority rules analysis was performed where 50% or more of the FOI unit would need to coincide with the data theme, such as critical habitat, to receive the designation. This majority rules process was also applied to themes where spatial subdivision of FOI polygons was not needed and stand level designation was sufficient for the analysis.

Rasterizing and Unique ID Assignment

To facilitate GIS processing all vector GIS data layers were converted to a 10 by 10 meter raster cells (1 cell = .025 acres – UTM zone 10, NAD83) and the data was partitioned into tiles which were based on 24K USGS Quads (~ 35,000 acres, 6 miles east/west by 8.5 miles north/south). Within each tile every unique combination of GIS data layers was intersected with the Forest Operations Inventory received a unique identifier (WPR_ID). The example below illustrates one FOI unit (840369) being subdivided into 4 unique areas based on how riparian reserves and roads intersected the forest stand. This GIS subdivision of the forest stands allows the OPTIONS model to simulate how each of these portions of the stands would develop.

WPR_ID	FOI #	GIS ACRES	RIPARIAN RESERVE	ROAD BUFFER	DESCRIPTION
124000005	840369	28.84	N	N	Outside riparian reserve Outside of road buffer
124000008	840369	0.99	N	Y	Outside riparian reserve Within road buffer
124000004	840369	10.90	Y	N	Inside riparian reserve Outside of road buffer
124000013	840369	0.49	Y	Y	Inside riparian reserve Within road buffer

The unique ID (WPR_ID) carries through the OPTIONS modeling projections for the purpose of tracking each spatial entity. OPTIONS classification of allocations or projections of forest conditions were returned to GIS as attributes with the unique IDs which were linked back to the original grid to produce spatial products.

Data Vintage

A snap shot of the Forest Operations Inventory (FOI), Land Use Allocation (LUA), Timber Production Capability Classification (TPC), Occupied Marbled Murrelet Sites (OMMS), and the Landlines (LLI) data were captured for the Western Oregon Plan Revision (WOPR) analysis. The data represents the conditions as of 10/1/2005. The guidance on capture of this data was issued in the 2005 Information Bulletin IB-OR-2005-142. The other GIS datasets reflect the best available information at the time of the analysis.

GIS Data Themes

See the modeling rules section for further description of the GIS data themes used in the modeling.

Forest Growth and Yield Modeling

Introduction

The purpose of simulating forest stand growth and development is to permit analysis of the effects of different silvicultural systems and silvicultural practices on timber yield and stand structure. Modeling estimates are not intended to describe the structures and volumes of current stands which may be quite different (higher or lower in volume) than projected future stands depending on the kind of management questions explored in the analysis.

The yield tables described in this section were used in the OPTIONS model to produce a series of different Allowable Sale Quantity (ASQ) estimates for different management alternatives.

Two computer growth and yield simulation models; ORGANON and CONIFERS were used to project the growth and development of forest stands under various silvicultural prescriptions.

Organon Model Description

ORGANON is an individual-tree, distance-independent model developed by Oregon State University using data from western Oregon forest stands with ages of the dominant trees ranging from 10 to 120-years-old breast height age (Hann 2005). The architecture of the model makes it applicable for simulations of traditional and non-traditional silviculture (Hann 1998).

Simulations of stand growth of the WOPR silvicultural prescriptions extend beyond the ORGANON model's range of data. However, the timing of harvests and other silvicultural treatments generally occur within the range of the model's validated height growth projection and volume prediction capabilities. Height growth is the primary driving function in ORGANON (Ritchie 1999). Hann (1998) found that the ORGANON height growth equations can be extended to up to 245 years without loss of accuracy, or precision. Validation tests of ORGANON comparing projected volumes to those found in the published normal yield tables for predominantly Douglas-fir and mixed-conifer stands applicable to western Oregon and northern California indicated that ORGANON projected volumes were within the limits of the values found in "fully" stocked natural stands, out to stand ages of 160 to180-years-old, the upper data limit of the published normal yield table (Hann 1992).

Three variants of ORGANON are available for use in western Oregon, two of which were deemed appropriate for modeling conditions and proposed actions on BLM land. The northwest Oregon variant (NWO-ORGANON) was used to project the growth of forest stands located on the Salem, Eugene, Coos Bay and Roseburg Districts. The southwest Oregon variant (SWO-ORGANON) was used to project forest stand growth on the Roseburg, Coos Bay, Medford and Lakeview Districts.

The standard ORGANON configuration is not conducive to the efficient processing of large numbers of individual tree lists representing forest stands within a stratum, and merging simulation results to develop average timber yield functions. Also, the standard model does not produce specific stand structural characteristics that have utility for effects analysis on resources other than timber production, or for the incorporation of factors to simulate growth improvement of trees due to genetic improvement programs. FORsight Resources developed a version of ORGANON for BLM, referred to as DBORGANON, which incorporates all the basic ORGANON functions and meets the additional BLM requirements. DBORGANON was used to project the growth of forest stands greater than or equal to 15 years-old.

Conifers Model Description

CONIFERS is an individual-plant growth and yield simulator developed from young mixed-conifer stands in southern Oregon and northern California by the U.S. Forest Service. CONIFERS provides growth forecasts for young plantations of single species or mixed-species growing with or without competition from shrubs (Ritchie 2006). The growth of forest stands less than 15 years-old was simulated using the CONIFERS young stand growth model. The tree lists were exported to DBORGANON at stand age 15 years-old for further simulation.

Stand Modeling Process

The prediction of forest stand development requires the growth projection of BLM's *existing* forest stand types into the future, with and without further silvicultural treatments, and the simulation of stands which represent *future* stands, i.e., new stands created following timber harvest. Depending on the management direction of the alternatives, both existing and future stands may be subject to different intensities of silvicultural treatments.

Existing Stands Modeling Groups Description

The land base consists of *existing* forest stands, the result of past harvests and natural disturbances, of various ages, structures, past management histories and potential for forest management. Tree lists from Current Vegetation Survey (CVS) inventory subplots were stratified into modeling groups as described in section 2 of this appendix. Using DBORGANON, these modeling groups were used for depicting current stand condition and simulating future development with and without future silvicultural treatments.

Each individual CVS subplot tree list within a modeling group was projected by DBORGANON subject to a common silvicultural prescription to stand ages 200 or 400 years-old, depending on the initial range of stand ages in the various modeling groups or the requirements of an alternative. Modeling groups consisting of younger managed stands, generally less than 60 years-old, were generally projected to stand age of 200 years. Older stand modeling groups were projected to a stand age of 400 years to insure that all CVS plots would be incorporated into the simulation.

Each individual tree list entered the simulation at its current age. This resulted in some stands having a greater weight on the overall group average characteristics, depending on the distribution of plot ages in a particular modeling group.

Future Stands Modeling Groups Description

Modeling groups and tree lists for forest stand types or silvicultural prescriptions for which little or no specific CVS data existed, were developed from subsets of the CVS data and growth was modeled with CONIFERS.

Initial stand attributes for the future stands tree lists were derived from the 10 and 20 years-old age class CVS subplots, stratified by DBORGANON variant, species group and site class. It was assumed that the future young stand management intensity and tools available would be similar to the past two decades.

Review of the data indicated that the *future* stands could be represented by three basic modeling groups for the northwestern Oregon and six groups for the



southwestern Oregon. A single future stand tree list for each modeling group and site productivity was grown in CONIFERS to age 15 years-old, at which time the tree lists were exported to DBORGANON for further simulation. Projections were simulated to a stand age of 200 years-old, except for Alternative 3 where 400-year projections were required.

These future stand projections formed the basis for initiating *new* stands following regeneration harvests in all alternatives and the "partial" harvests in Alterative 3. The future stands category includes "existing" stand types created as a result of regeneration harvest prescriptions under the current BLM Resource Management Plans. There were an insufficient number of CVS subplots with this type of management for Guide Curve modeling. Therefore, it was necessary and appropriate to create tree lists for simulating those silvicultural prescriptions for existing and future stands under the Alternative NA.

For all alternatives, a special subset of modeling groups was developed for modeling future stands within geographic areas currently identified with a high incidence of Swiss needle cast disease. Future tree lists species composition in the Swiss needle cast zone was based on an assumption of higher proportions of disease resistant species being used for reforestation of harvested areas.

Types of Growth Curves

The results of DBORGANON growth projections are summarized in tabular form. Two types of curves are produced from DBORGANON simulations for further use by the OPTIONS model. The curves are referred to as *guide* and *treatment response* curves.

Guide Curves

Guide curves are used to provide guidance to the OPTIONS model with respect to growth curve shape and projection values. Simply stated, guide curves represent the growth projection of forest stands without any additional silvicultural treatments. Individual guide curves are developed for each modeling group which incorporates geographical province, species groups, current stand condition, and site productivity class. Future stand guide curves developed from CVS data were applicable to all alternatives. Separate guide curves reflecting two-aged silvicultural prescriptions were prepared for Alternatives NA and 3. Even-aged curves were developed for Alternatives 1, 2, and 3.

Treatment Response Curves

Treatment Response curves were used to adjust the guide curves to reflect the effects of various silvicultural treatments (see discussion of Treatment Response). Simulations were done to produce curves incorporating commercial thinning and fertilization treatments. Precommercial thinning of future stands was

incorporated into the initial ORGANON guide curve tree lists, so no growth response curves were necessary for that treatment type.

Silvicultural prescriptions incorporating commercial thinning were developed using the modeling groups with stands less than 60 years-old. Guide curve simulations were examined for each modeling group to determine the earliest average age when an initial commercial thinning was feasible.

Evaluation criteria included three factors 1) stand relative density (Curtis 1982), 2) attainment of minimum average stand diameter and 3) minimum harvestable volumes. For each modeling group simulations were done to determine the appropriate timing of treatment based on relative density rules. Proportional thinning is simulated when minimum criteria were met.

Relative density rules vary by land used allocation within alternatives. Silviculture prescriptions for land use allocations with timber production emphasis goals [Northern General Forest Management Area (Alternative NA); Timber Management Area (Alternatives 1 and 2) and General Landscape Area (Alternative 3) were thinned to maintain relative densities between 35 and 55. The final thinning should not prevent the recovery of relative density to a minimum of 55 at rotation age. Assumed rotation ages for treatment response simulations in timber emphasis land use allocations were based on *culmination of mean annual increment (CMAI)* and range from 100 to 125 years..

Commercial thinnings have been found to contribute to the establishment of conifer regeneration in the understory of thinned stands (Bailey and Tappeiner 1998). Simulation of the recruitment of this regeneration in the growth simulations was done to reflect expected stand dynamics following commercial thinning harvests. The ORGANON growth and yield model (Hann 2005) does not recognize trees with diameters less than 4.5 feet at breast height. Therefore, regeneration tree lists were developed using existing CVS data and growth relationships from current published and unpublished studies. The regeneration trees were added to DBORGANON simulations 20 to 25 years following any commercial thinning. The time lag represented the estimated time for all trees in the regeneration tree list to reach 4.5 feet tall.

Silviculture prescriptions for land use allocations where objectives other than timber are emphasized [Southern General Forest Management Area, Connectivity/Diversity Block, Riparian Reserve, Late Successional Reserve (Alternative NA); Riparian Management Area, Late Successional Management Area (Alternatives 1, 2, and 3)] were thinned to maintain relative densities between 30 to 50 to a maximum age of 80 years-old in Alternative NA, or until minimum desired stand structural class is attained in Alternatives 1, 2, and 3. Fertilization is not assumed to occur on these land use allocations.

Fertilization:

Fertilization with 200 pounds of active nitrogen per acre is simulated to occur after thinning in all alternatives. Fertilization was modeled when the land use allocation was considered part of the timber base, the stand is even-aged, two-aged with low green tree retention (≤ 8 dispersed retention trees per acre), two-aged with aggregated retention (partial harvested areas) and when DBORGANON criteria were met. DBORGANON criteria for treatment were when the stand contains 80% or more Douglas-fir by basal area and is less than 70 years-old.

Within the constraints of other modeling assumptions, all possible combinations of treatments were simulated for each modeling group to allow a wide range of treatment timing, combination and flexibility within the OPTIONS model.

General Silvicultural Systems and Modeling Approaches

A *silvicultural system* is a planned series of treatments for tending, harvesting, and re-establishing a *stand.* The system name is based on the number of age classes managed within a stand: *even-aged, two-aged, uneven-aged.* These three general silvicultural systems were modeled using CONIFERS in concert with DBORGANON to meet the objectives of the alternatives. The type of systems employed varied by alternative and land use allocations within alternatives. The three general systems as traditionally defined are most applicable to the land use allocations comprising the ASQ *timber base*.

The even-aged system uses the *clearcutting* or *shelterwood cutting* method to regenerate existing stands. The two-aged system uses a *variable-retention harvest* method to achieve the same goals. The uneven-aged system achieves regeneration through *selection harvest.*

Common to All Alternatives

The management of the non-ASQ land base such as; Late Successional Reserve/ Management Area and the Riparian Reserve/Management Area does not correspond well with any of the general silvicultural system definitions. In practice it is assumed that a *variable-density thinning* harvesting method is used. For modeling purposes, a commercial thinning harvest cutting trees in proportion to their representation in the stand was simulated for all alternatives following the previously described relative density criteria.

Alternative NA

Alternative NA employs a two-aged silvicultural system on the General Forest Management Areas, Southern General Forest Management Area and

Connectivity/Diversity Block land use allocations. Regeneration harvests were modeled with the retention of a specific number of the largest overstory trees for non-timber objectives. The number of retention trees per acre totaled 7, 16 or 12 respective of the Northern General Forest Management Area, Southern General Forest Management Area, and Connectivity/Diversity Blocks land use allocations. In addition, 0, 3 and 4 hardwood trees were retained respectively. The spatial arrangement of retention trees was modeled as *dispersed retention*.

The OPTIONS model simulates retention trees by assuming that the retention trees continue to grow on the pre-harvest existing stand guide curve generated by DBORGANON while the regenerated portion of the stand follows a new DBORGANON generated future guide curve. The amount of green tree retention is determined on the basis of pre-harvest basal area being retained. For each land use allocation a single percent basal are was applied to all age groups, site classes, and modeling groups.

For Alternative NA the amount of retention tree basal area was determined by simulating the growth of a young stand modeling group of average density and site productivity to age 100 years-old, at which time a harvest treatment leaving the largest 7, 12 or 15 retention trees representing the Northern General Forest Management Area, Connectivity/Diversity Blocks, and Southern General Forest Management Area respectively is done. The percentage of the retention tree basal area divided by the pre-harvest total stand basal area at age 100 years-old determines the appropriate allocation for modeling green tree retention in OPTIONS.

Alternatives 1 and 2

Application of even-aged systems without green tree retention was modeled in Timber Emphasis Area land use allocation. Green tree retention is not required for Alternative 1. Green tree retention for Alternative 2 was not modeled due to the small amount of volume required as a minimum.

Alternative 3

Alternative 3 employs a two-aged silvicultural system in the General Landscape Area generally north of Grants Pass, Oregon. Depending on landscape structural stage criteria and vegetation zone, regeneration harvests were modeled with varying amounts of retained overstory trees as dispersed retention or aggregated retention. An uneven-aged management silvicultural system is applied in the zone south of Grants Pass, Oregon on the Medford and Lakeview Districts.

The dispersed retention approach used the DBORGANON yield functions derived for the Alternative NA, Northern General Forest Management Area land use allocation which closely approximated (seven trees per acre) the Alternative 3 retention tree requirements for regeneration harvests of six



trees per acre in the western hemlock zone or nine green trees per acre in the Douglas-fir and tanoak zones.

Aggregated retention is designated as "partial harvest" to further distinguish the difference in Alternative 3 with the dispersed retention harvest method. Partial harvests retained retention tree blocks constituting 18%, 33% or 37% of the existing stand in the Douglas-fir, tanoak, and western hemlock zones respectively. The proportion of the pre-harvest stand basal area retained was determined using similar methodology to that used for Alternative NA described above with the following exceptions. Simulated harvest ages were 80 years-old for the Douglas-fir and tanoak zones, and 120 years-old for the western hemlock zone. Also, the retention tree basal area was estimated using Alternative 3 retention tree minimum size classes definitions, which varied by vegetation zone. The basal area calculations also included some merchantable trees which did not meet the minimum retention tree size. Inclusion of these smaller trees was done based on the assumption that little or no harvest would generally occur within the aggregated retention blocks.

Future growth of the aggregated retention blocks was represented by their continued growth using the pre-harvest existing stand guide curve. Growth of the harvested portion was represented by Alternative 1 even-aged future stand guide curves with no retention.

The uneven-aged management zone harvests consisted of periodic selection cuttings applied to stands from each representative modeling group. Harvest frequency ranged from 20 years to 60 years with harvests generally occurring more frequently on higher sites. Selection cutting was modeled as a proportional commercial thinning at regular intervals using residual basal area targets which varied by modeling group. Predominantly Ponderosa pine stands were managed at lower residual basal area levels than mixed-conifer groups. After each harvest a regeneration tree list was added to the simulation to reflect natural and artificial reforestation occurring. Regeneration tree lists generally included a proportional representation of species included in the stand's original species mixture.

Special adaptations to cutting practices were applied to the various modeling groups. For example, in the Ponderosa pine modeling groups, some stands were managed to reduce the proportion of Douglas-fir to favor pine growth.

Growth and Yield Adjustments

DBORGANON projections of timber yields needed to be adjusted to account for increased growth due to genetic tree improvement and reduced to account for the effects of additional overstory mortality in older and partial cut stands. Adjustments for factors which could substantially affect stand dynamics; including genetic tree improvement, Swiss needle cast disease and other overstory mortality were accomplished by means of factors applied within the DBORGANON model. Other factors affecting recoverable

commodity volumes were modeled as a percent reduction in volume. Timber defect and breakage, endemic insects and disease, soil compaction, future snag creation, future coarse woody debris creation, green tree retention were applied in the OPTIONS dataprep program to account for guidance requirements specific to each alternative.

Tree Improvement

Conifer species such as Douglas-fir and western hemlock have been selected for genetically controlled characteristics such as high growth rates and tree form. BLM in cooperation with other landowners have established field test sites using progeny from the selected trees. These *progeny test sites* have been measured at regular intervals and the data collected has been used to select those parent trees which are ranked highest in growth rates. *Seed orchard*s have been established to produce locally adapted seed from these selected trees for reforestation of harvested stands and natural deforestation.

The increased growth and yield effects from utilization of genetically improved seedlings was accomplished by the use of a one-time growth increase to tree lists exported from CONIFERS and the application of growth modifiers applied to future stand modeling groups in DBORGANON.

Height and diameter of genetically improved trees exported from CONIFERS at age 15 years-old were increased before importation into DBORGANON by 7% and 8% respectively based on the observed height and diameter percentage increase of the top one-quarter trees in the progeny tests. After importation of the tree lists into DBORGANON, growth modifiers were applied to future stand modeling groups to account for incremental *genetic gain* expected to accrue beyond age 15 years-old. Growth modifiers have been found to be an effective way to incorporate genetic gain from tree improvement programs into growth models (Carson 2003).

Growth modifiers have not been publicly developed for Pacific Northwest tree improvement programs, although work is currently underway (USDA 2006). Finalized growth modifiers for regional growth and yield models are expected within a year or perhaps more.

In the interim, growth modifiers were adapted from the preliminary feasibility work (Johnson and Marshall 2005) by BLM personnel. These factors are used to modify growth and mortality rates of genetically improved seedlings for simulations of the future stands modeling groups. The DBORGANON model was specifically configured to allow the use of growth modifiers for simulation of genetic gain and other purposes.

Growth modifiers are applied in DBORGANON as described below.

1) Growth modifiers apply to Douglas-fir within land used allocations designated as part of the timber base for all alternatives, when stands are managed under even-aged silvicultural systems, two-aged systems with aggregated overstory

retention, or dispersed retention with low overstory density. No increased growth from genetic improvement is simulated for lands managed using uneven-aged silvicultural systems, or with high levels of dispersed retention overstory

2) Growth modifiers apply to western hemlock using the criteria as Douglas-fir except that it is confined to area designated as the Swiss needle cast zone on Salem District only (see Disease section).

3) Growth modifiers were calculated for each BLM district, but since no significant difference was observed, average westside BLM growth modifiers were used.

4) Existing BLM seed orchards have the biological capability to produce improved seed in excess of probable need.

5) Growth modifiers were reduced to account for pollen contamination from non-genetically improved trees adjacent to and within the BLM seed orchards.

6) Growth modifiers are applied from stand age 15 to 100 years-old.

Defect and breakage

A proportion of harvested trees can contain defects which reduce its utility from a commodity standpoint. Also, damage can occur during harvesting, that results in breakage which reduces recoverable timber volume. The proportion of volume which is not recoverable for commodity use generally increases with stand age. DBORGANON generated timber volume yields were reduced by BLM district specific factors derived from historical timber sale cruise and scale data.

Soil Compaction

Districts with available data as to the extent and degree of soil compaction applied a yield reduction factor to DBORGANON yields. The deductions were applied to on the Lakeview, Medford and Salem Districts.

Snag Retention

The yield impact of retaining varying amount of green trees for the creation of future snags was done by leaving extra retention trees or applying a percent volume reduction to meet the minimum snag requirements at the time of harvest. Retention requirements varied by alternative and by land use allocation.

Coarse Woody Debris Retention

The yield impact of retaining varying amounts for future down woody debris on timber yield was modeled as a percent volume reduction at the time of harvest. Retention requirements were varied by alternative and land use allocation.

Stocking Irregularity

For any level of stocking, a portion of a stand may consist of openings which do not contribute to stand volume at any point in time, i.e., a stand may contain non-stocked openings of a size sufficient to affect timber yield. These openings may be thought of in terms of less-than-perfect stocking or in terms of variation in tree location and fall into two categories; permanently incapable of growing commercial tree species, and those temporarily unoccupied by desirable trees.

Portions of stands may contain permanent areas of non-productive rock or other areas incapable of growing commercial tree species. This condition is partially accounted for through reductions in the timber base through the Timber Productivity Capability Classification.

Temporarily non-stocked areas occur due to variation in reforestation success from a variety of non-permanent factors, such as vegetative competition or logging slash.

The ORGANON model accounts for stocking variation by assuming that the degree of local competition experienced by a tree is reflected in its crown size. Trees growing next to openings have longer crowns and poor growth reflected as stem taper which reduces the volume of a tree next to the opening, compared to a similar size tree with shorter crown in an area with more uniform tree distribution. As long as the crown characteristics of sample trees are measured, then any long-term spatial variation within the stand will be modeled appropriately (Forsight 2006).

Since existing CVS data used for existing stands and the development of future stands modeling groups contain the necessary crown measurement, no external adjustment for stocking irregularity was applied to DBORGANON yields.

Green tree retention has two effects from a stand growth and yield standpoint. First, otherwise harvestable volume is foregone for commodity use at the time of harvest. Methodology for determining this allowance was described previously for each alternative. Second, retention trees compete for growing space with the newly regenerated trees.

The first effect of retained trees on foregone harvest volume is modeled with the OPTIONS model as a stand constraint. A proportion of the stand equating to the amount of basal area per acre of the uncut stand retained is "set-aside" and is simulated to continue to grow on the existing guide curve until the next regeneration harvest. At that time a new set of retention trees would be set-aside to grow for the subsequent harvest cycle. The proportions ranged from approximately 10% to 20% for Alternative NA and from 18% to 37% for Alternative 3 depending on land use allocation or vegetation zone..

The second effect was modeled using DBORGANON for Alternative NA and by using a fixed percentage yield reduction for Alternative 3.

Alternative NA future modeling group tree lists included the required number of retained trees as overstory. The retained trees slowed the growth of the "new" understory in roughly proportional to the amount of retained overstory trees. The volume of the retention trees was not included in DBORGANON estimates of potential timber yield, but included for evaluating overall stand characteristics and structural stages.

Alternative 3 partial harvest yields from future stands were reduced by 5% percent to account for "edge effect", i.e., the effects of the aggregated retention blocks of overstory trees competing with the new tree regeneration. The factor used is an average reduction observed from modeling work in British Columbia (Di Lucca et al. 2004).

Disease

Two types of reductions were used to simulate the effects of endemic levels of insect and disease on timber yields. The first method was through the DBORGANON model using a growth modifiers approach for areas of Salem District with moderate to severe levels of Swiss needle cast disease. The second method used a percentage reduction in yield approach applied in OPTIONS data-prep program to the guide curves for all districts to account for other insect and disease effects.

Swiss needle cast

Portions of the Salem District are located in an area with moderate to high occurrences of Swiss needle cast disease. This disease infects Douglas-fir trees only and substantially reduces growth rates. It does not affect the growth of other tree species. A growth modifier approach similar to that used for modeling growth of genetically improved trees was employed in DBORGANON to reflect estimated growth reductions for Douglas-fir in the Swiss needle cast zone.

Three Swiss needle cast (SNC) zones were developed for BLM land consistent with Oregon Department of Forestry (ODF) criteria, a severe, moderate, and a no impact zone.

BLM calculated mean foliage retention values for the severe and moderate zone using plot data from ODF Swiss need cast surveys. The foliage retention values were used to calculate growth loss in height and basal area by severity zone using ODF methodology (ODF 2005). The growth loss modifiers were applied in DBORGANON to existing and future stand modeling groups in order to simulate more realistic stand dynamics.

As stands are regeneration harvested in the Swiss needle cast zones, an average mix of tree species will be used for reforestation that is different than the current stands composition. Future tree lists reflecting tree lists with a minority of Douglas-fir were generated using the process described above for future stands modeling

groups. Tree lists with a single average species composition for both zones containing 28% Douglas-fir was used. Examination of the simulation results for the moderate and severe Swiss needle cast zones showed no substantial difference in predicted timber yields (<1%) so a single yield function was used.

Other Insects and Disease

Some of the effects of endemic levels of insects and disease other than Swiss needle cast on timber yields are assumed to be reflected in the defect and breakage allowance described previously and the additional overstory mortality factor described below. In addition to those factors, further allowance was deemed appropriate for insects and diseases by adjusting timber yields down by a percent volume reduction. These factors generally vary from about 1% to 3% increasing with stand age and are based are based on literature and professional judgment.

Additional Overstory Mortality Factor

The ORGANON model underestimates tree mortality from causes other than inter-tree competition, such as insects, disease, windthrow and stem breakage, (Tappeiner et al. 1997). This type of mortality is often *irregular*, or episodic in nature, and it is inherently difficult to predict the exact time period in which it will occur (Franklin et al 1987). For mature stands, mortality from inter-tree competition becomes less significant as stands age and mortality from other factors becomes more substantial.

To account for mortality from these other factors, an irregular mortality adjustment of 1.4% per DBORGANON growth cycle (five years) was determined from a review of ecological literature and Continuous Forest Inventory data (Lewis and Pierle 1991).

The 1.4% factor was applied to existing and future stand modeling groups through a function in the DBORGANON model. The factor applied only to trees greater than 20" diameter breast height in stands aged 100 years-old and older, to simulate mortality of larger trees from causes other than inter-tree competition.

In addition, partial cutting has been reported to significantly increase wind damage, especially during the first few years after treatment. Amount and extent are dependent on individual site factors, landscape conditions, and severity of the storm event (Strathers et al 1994). Average mortality for retained trees in partial cut Douglas-fir stand during the first five years post harvest from non-suppression factors averages about 1-2% Williamson and Price 1973; McDonald 1976; Jull 2001). To account for this type of mortality, the same 1.4% factor was applied to stands which represented regeneration harvests with dispersed green tree retention. Model limitations allowed the use of only one additional mortality factor in a simulation. Therefore, the additional mortality factor was applied at stand age of 20 years-old, corresponding to the end of the first growth cycle in

DBORGANON to trees greater than 20" diameter breast height.

Application of the additional 1.4% mortality rate during growth simulations produced modeling results which more closely matched patterns of stand development supported by empirical data and ecological theory than simulations done without the factor (Lewis and Pierle 1991).

Definitions

Aggregated retention - See *variable-retention harvest system*

Annual Productive Capacity / Allowable Sale Quantity - These terms are synonymous. The timber yield that a forest can produce continuously under the intensity of management outlined in the RMP from those lands which are allocated for permanent forest production.

Board foot - A unit of solid wood, one foot square and one inch thick.

Canopy - The more or less continuous cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand. Where significant height differences occur between trees within a stand, formation of a multiple canopy (multi-layered) condition can result.

Clearcutting - The cutting of essentially all trees, producing a fully exposed microclimate for the development of a new stand of trees.

Coarse woody debris (CWD) - Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses, on the ground or in forest streams

Commercial thinning - Any type of thinning operation producing merchantable material at least equal to the value of the direct cost of harvesting and hauling the timber to market.

Culmination of mean annual increment (CMAI) - The age in the growth cycle of a tree or stand at which the *mean annual increment* (MAI) for volume is at maximum. At culmination, MAI equals the *periodic annual increment* (PAI). CMAI computations can vary widely depending on the purpose (economic or biological) and measurement criteria (board-foot vs. cubic-foot)

Dispersed retention - See *variable-retention harvest system*

Even-aged management - A silvicultural system which creates forest stands that are primarily of a single age or very narrow range of ages.

Even-aged stand - A stand of trees composed of a single age class in which the range of tree ages is usually ± 20% of rotation

Genetic gain - The average improvement of a specific trait in a population of progeny over the average of the parental population, e.g., height growth increase

Tree retention - A stand management practice in which live trees as well as snags and large down wood, are left within harvest units to provide habitat components over the next management cycle

Mean annual increment (MAI) - The total cumulative quantity produced over time of some attribute of a tree or stand growth, e.g., wood volume divided by the total age of the tree or stand

Merchantable - Trees or stands having the size, quality and condition suitable for marketing under a given economic condition, even if not immediately accessible for logging

Multi-layered canopy - Forest stands with two or more distinct tree layers in the *canopy*

Overstory - That portion of trees which form the uppermost layer in a forest stand which consists of more than one distinct layer

Periodic annual increment (PAI) - The difference in stand volume at two successive measurements, divided by the number of years between measurements. PAI is sometimes termed current annual increment (CAI).

Precommercial thinning (PCT) - The practice of reducing the density of trees within a stand by manual cutting, girdling, or herbicides to promote growth increases or maintain growth rates of desirable tree species. The trees killed are generally unmerchantable and retained on the treated area.

Progeny test site - A test area for evaluating parent seed trees by comparing the growth of their offspring seedlings

Regeneration - Tree seedlings or saplings existing in a stand

Regeneration harvest - A timber harvest conducted with the partial objective of opening a forest stand to the point where seedlings of favored tree species will be established.

Relative density - A means of describing the level of competition among trees or site occupancy in a stand relative to some theoretical maximum based on tree size and species composition

Rotation - The number of years between establishment of a forest stand and its regeneration harvest

Seed orchard - A plantation of clones or seedlings from selected trees; isolated to reduce pollination from outside sources, weeded of undesirables, and cultured for early and abundant production of seed

Selection cutting - A method of uneven-aged management involving the harvesting of single trees from stands (single-tree selection) or in groups (group selection) without harvesting the entire stand at any one time

Shelterwood cutting - A method of regeneration harvest under an even-aged silvicultural management system. With this method a portion of the mature stand is retained as a source of seed and/or protection during the regeneration period. The retained trees are usually removed in one or more cuttings.

Silvicultural prescription - A planned series of treatments designed to change current stand structure to one that meets management goals



Silvicultural system - A planned series of treatments for tending, harvesting, and re-establishing a stand. The system name is based on the number of age classes managed within a stand, e.g., *even-aged, two-aged, uneven-aged.*

Snag - Any standing (upright) dead tree

Stand - An aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition so that it is distinguishable from the forest in adjoining areas

Thinning - A silvicultural treatment made to reduce the density of trees within a stand primarily to improve tree/stand growth and vigor, and/or recover potential mortality of trees, generally for commodity use

Timber Productivity Capability Classification (TPCC). - Classification of BLM lands based on the physical and biological capability of the site to support and produce forest products on a sustained yield basis.

Two-aged system - A silvicultural system that regenerates and maintain stands with two age classes – the resulting stand maybe two-aged or trend towards an uneven-aged condition as a consequence of both an extended period of regeneration establishment and the retention of reserve (green live) trees that may represent one or more age classes.

Two-aged stand - A stand of trees composed of a two distinct age classes separated in age by more than ± 20% of rotation

Understory - That portion of trees or other woody vegetation which form the lower layer in a forest stand which consists of more than one distinct layer.

Uneven-aged management - A combination of actions that simultaneously maintain a nearly continuous forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes.

Uneven-aged stand - A stand with three (3) or more distinct age classes, either intimately mixed or in small groups

Variable-density thinning (VDT) - A thinning method where ≥ 2 densities of retained trees are used to promote stand heterogeneity through the development of *multi-layered canopies*. Provision of conditions conducive to the initiation and growth of regeneration is often an objective of VDT to encourage understory development

Variable-retention harvest system - An approach to harvesting based on the retention of structural elements or biological legacies (trees, snags, logs, etc.) from the harvested stand for integration into the new stand to achieve various ecological objectives – note the major variables in variable retention harvest systems are types, densities and spatial arrangement of retained structures; 1) *aggregated retention* is the retention of structures as (typically) small intact forest patches within the harvest unit; 2) *dispersed retention* is the retention of structures or biological legacies in a dispersed or uniform manner.

Windthrow - A tree or trees uprooted or felled by the wind.

OPTIONS Modeling

OPTIONS Model

Background

The OPTIONS model version V (OPTIONS or the model) is a spatially explicit, rules-based, land management simulation model. OPTIONS, developed by D.R. systems inc. (DRSI), has been in use for more than 20 years and is regularly updated and refined to reflect current knowledge, issues in land management and modeling techniques. The model has been used to develop land management strategies and operationally feasible plans on more than 500 million acres throughout North America, South America, the South Pacific and Asia. Most of these projects involved complex, multi-resource objectives and environmental regulations.

In the western United States OPTIONS has been used for a wide range of industrial and government analyses, including land trades, evaluation of lands for sale or purchase and the development of sustainable, multi-resource management plans. The model was used in Plum Creek Timber Company's 1997 Cascades Habitat Conservation Plan for central Washington State. The Habitat Conservation Plan was the first major, multi-species habitat conservation plan developed in the USA; for it Plum Creek won the 1997 U.S. Wildlife Stewardship Award. OPTIONS was also used in the Washington State Department of Natural Resources 2004 Sustainable Forest Management Harvest Calculations. The Sustainable Forest Management Harvest Calculations applied an alternatives based approach toward developing a long-term, sustainable, multi-resource forest management plan on approximately 2.1 million acres of Washington State Trust Lands. The approved management plan improved net revenues from State Trust Lands by more than 40% (more than $50 million dollars/year) while providing increased wildlife habitat and riparian resource protection. The model was also recently used to complete Pacific Lumber Company's (PALCO) 2005 Long-term Sustainable Yield Calculations PALCO owns approximately 217,000 acres of redwood forest land in northern California. The PALCO project set new standards for sustainable yield calculations and planning in California.

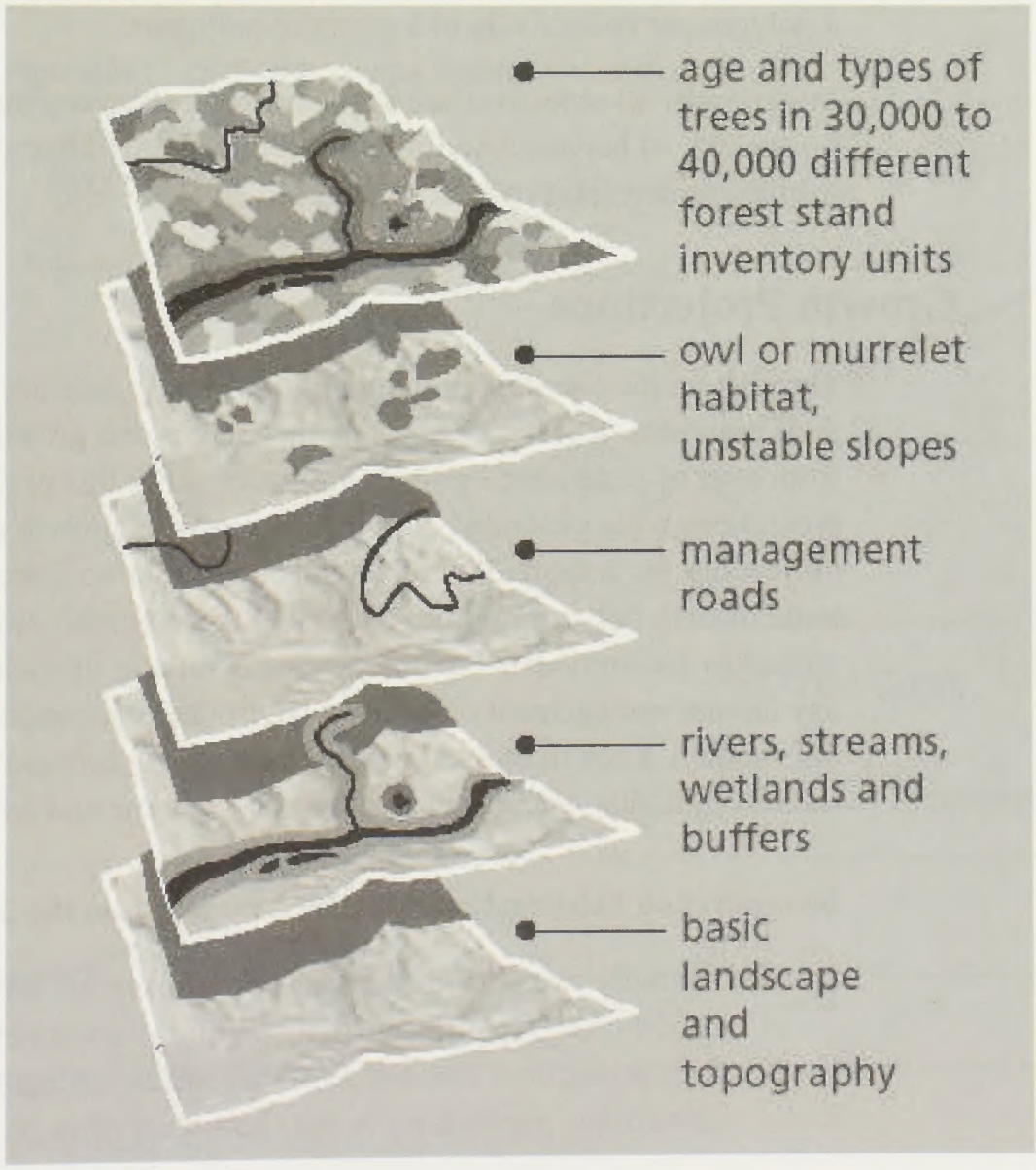
Currently the model is also being used by the University of Georgia to analyze the impacts of proposed regulations and policies on the States' long-term timber supply, by the California Department of Forestry in a pilot project investigating new approaches to the States' sustainable yield calculations, as well as numerous operational analyses in Washington, Alaska and British Columbia, Canada. DR Systems' expertise in partnership with BLM staff is using the OPTIONS model to analyze alternative management strategies for the Western Oregon Plan Revision.

This analysis provides the factual basis for comparing alternatives in terms of the forest conditions / habitats created over time as well as determining the sustainable harvest levels for the Western Oregon BLM districts.

OPTIONS Model Overview

OPTIONS simulates the growth and management of individual land management units within a BLM Sustained Yield Unit (SYU). Land management units are created in a GIS process that combines multiple layers of resource information and objectives into a single resultant layer. Examples of these resource layers would include Forest Operations Inventory units, administrative boundaries, riparian management areas, Late-Successional Management Areas, Visual Resource Management areas, etc.

Figure 340. Graphic example how a resultant layer is created from a number of resource layers. Multiple resource layers are overlaid in a GIS process to create a single resultant layer for use in OPTIONS.



The model utilizes the resultant file to dynamically maintain all of the spatial identity across all contributing layers enabling the model to apply spatially explicit growth projections and management rules to individual resultant units (polygons), or groups of polygons throughout the Sustained Yield Unit.

The planning horizon of a simulation can extend as far as 400 years. Inventory information for each resultant unit is used to initialize the model and for each subsequent year in the planning horizon growth projections forecast future conditions for each polygon. However, these growth projections are sensitive to management activities and rules.

Management activities, such as silvicultural treatments (for example site preparation, fertilization or pre-commercial thinning) and harvesting activities (for example commercial thinnings, selection harvest or regeneration harvest) are distinguished from management objectives such as the exclusion of harvesting activities within riparian management areas. Activities are applied to polygons individually, while objectives may be applied to individual polygons, portions of a polygon, or collectively to a group of polygons.

Importantly, all objectives are implemented before any management activity can be applied, so harvest activities are simulated only after all environmental and habitat requirements have been satisfied.

Growth Projections

Throughout the planning horizon individual polygons are grown according to their individual forest inventory characteristics and growth trends established from a set of generalized growth projections. For this project, the growth projections were generated with the ORGANON growth and yield model. These projections are imported into OPTIONS and used to forecast the nominal growth trend of each polygon. Within the model these growth projections are further refined to accommodate the unique characteristics of each polygon, including any unique management objectives, environmental conditions or inventory information. Growth projection attributes are tracked and reported including: stand height, diameter, basal area, density, volume and live crown ratio.

Incorporating Existing Inventory Information into the Simulation

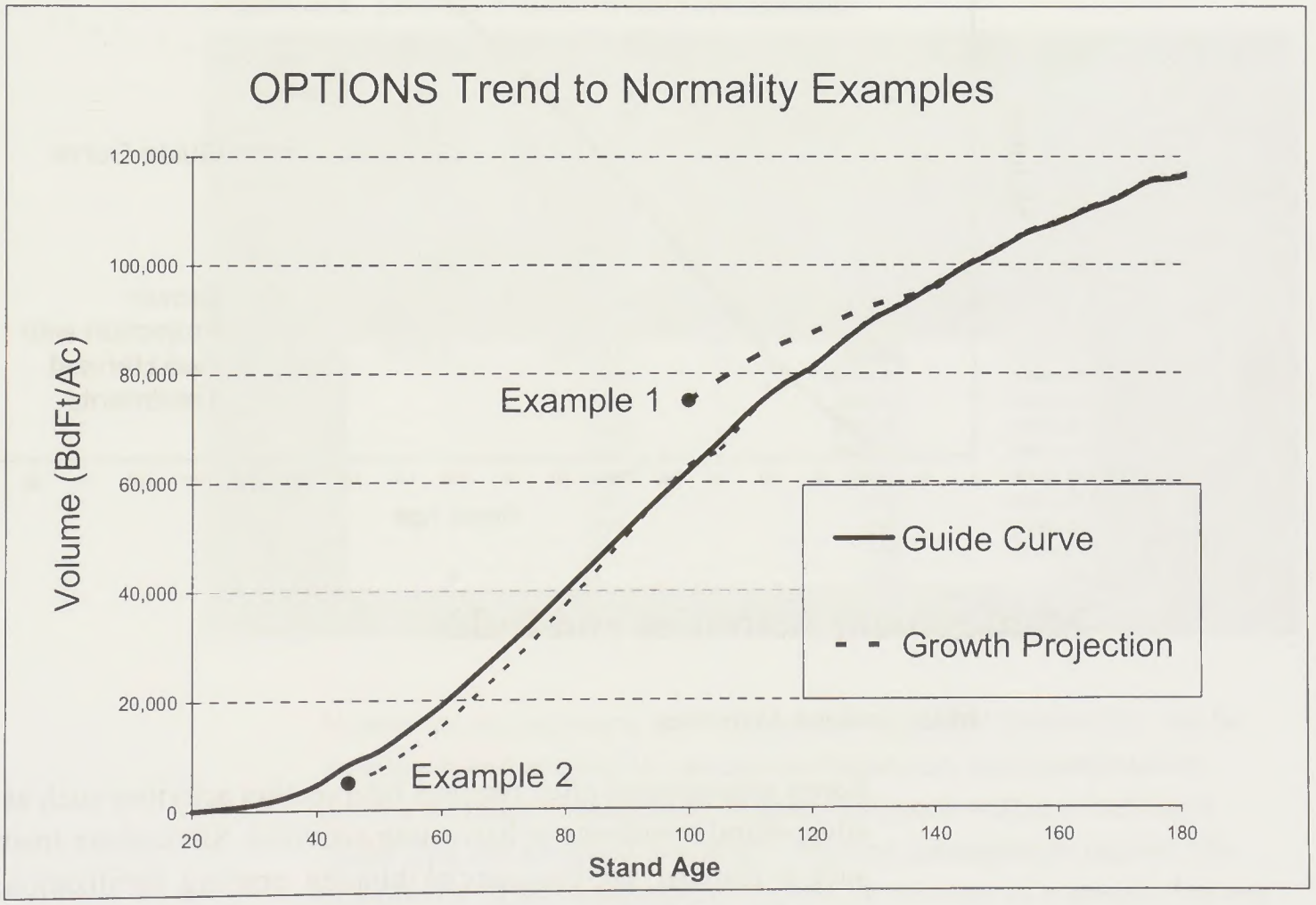
Spatially explicit forest inventory information reflects current forest conditions. Depicting current conditions accurately is important in forecasting how alternative management strategies impact future forest conditions, particularly in the short-term (first 20 - 50 years).

Where available, OPTIONS incorporates existing forest inventory information into the simulation analysis. Spatially explicit forest inventory information improves the analysis, but can create challenges because resource inventory classification systems often do not coincide

directly with modeled growth projections. Although the generalized growth projections are accurate across a broad set of polygons, they do not capture variations of current inventory conditions at the individual polygon level. Thus, projecting the future growth of individual polygons requires an integration of existing inventory information with the generalized growth model projection. This integration is accomplished by utilizing algorithms to normalize future growth from the individual polygon's current inventory condition towards the long-term growth model projection. The rate of normalization is scaled according to the proximity of the inventory value to the model prediction. The process, referred to as the "trend to normality" captures, with spatial integrity, current conditions while accounting for the future growth within the polygon.

The figure below provides two examples of the trend to normality process. The solid line represents the growth model projection, while the dashed lines represent the trend to normality projections for the individual polygon.

Figure 341. OPTIONS trend to normality examples.



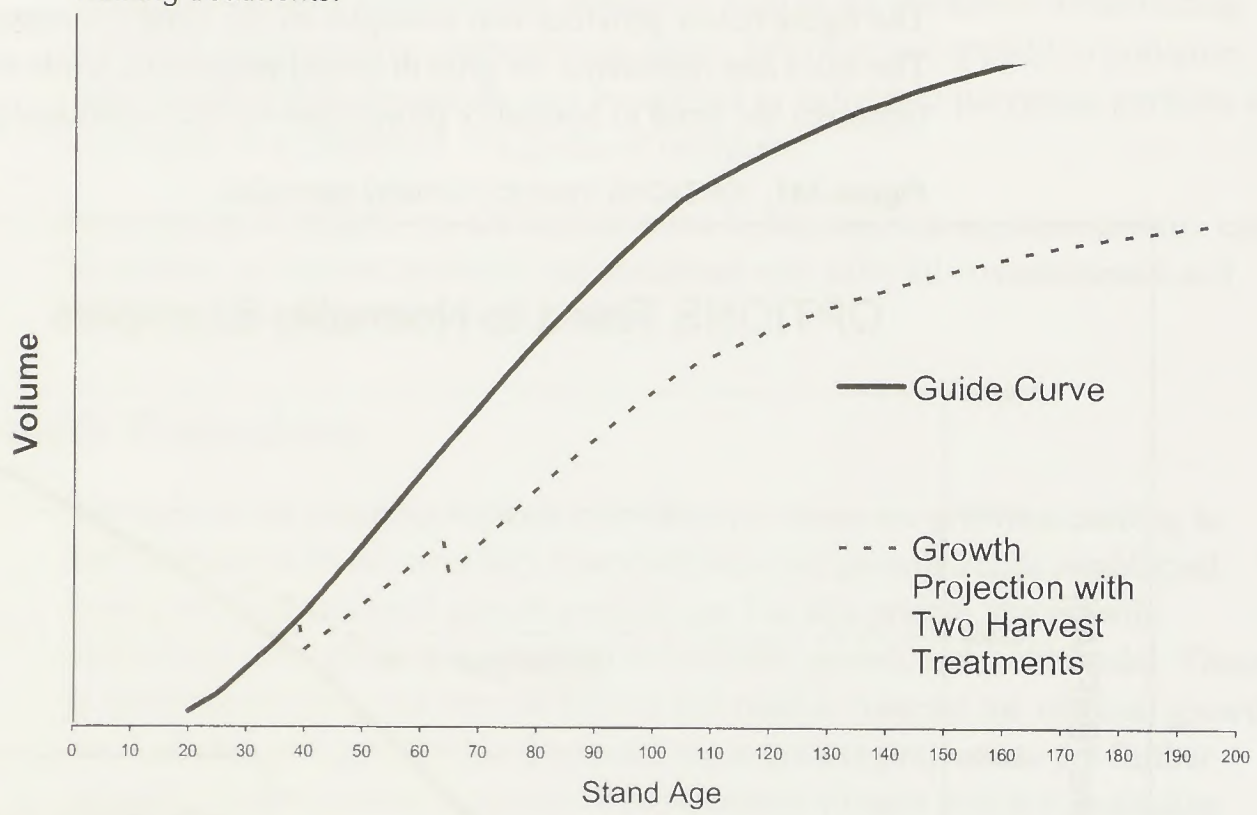
Treatment Adjustments and Responses

Growth projections are sensitive to management activities such as silvicultural treatments. Management activities are applied to individual polygons only when a set of eligibility criteria are met. Polygons that do not meet these criteria are not treated and their growth projection

is uninterrupted. Stands that meet the eligibility criteria, as well as all other management objectives, are treated and their growth projection is adjusted. This adjustment is specific to stand age, species, site productivity level, as well as treatment type and intensity. All of these treatment and adjustment variables are defined in the model based on experience gained from the growth and yield modeling, professional judgment, research, and management objectives.

The figure below provides an example of a volume growth projection and the adjustments applied for two stand thinning treatments. Growth projection for a polygon without treatment following the guide curve and the adjustments for two stand treatments at ages 40 and 60.

Figure 342. Example of a volume growth projection curve and adjustments for thinning treatments.



Management Activities and Rules

Management Activities

Forest management often requires intervention activities such as silvicultural treatments or harvesting activities. Silviculture treatments such as planting, pre-commercial thinning, pruning, fertilization, commercial thinning and selection harvest are explicitly defined, that is; their timing, intensity, duration and biological response are all defined in the model based on experience gained from the growth and yield modeling, professional judgment, and research.

Additionally, treatments are subject to stand (polygon) level and landscape level eligibility criteria. An example of a stand level eligibility rule would be a minimum age or basal area threshold. A landscape level eligibility criteria would be an upper limit on the commercial thinning volume, within a Sustain Yield Unit. Silviculture treatments were not applied unless all eligibility criteria were met.

Harvesting activities are also subject to stand level and landscape level rules. An example of a polygon level harvest rule would be a minimum harvest age or a minimum residual volume per acre. There can be a number of landscape level harvest rules that control the maximum and minimum harvest levels by species type, species and wood-type priorities, polygon age and treatment type and landscape management objectives.

The figure below provides an example set of landscape level harvest rules requesting minimum and maximum board foot volume level by species group.

Figure 343. Landscape level harvest rules example.

Harvesting Rules

Problem Definition

Name: COO_NA_ASQ_ Date: 08-22-2006

Database: COO_NA Time: 14:53:43

OK | Cancel | Clear

Harvesting Volume Limits by Species Group (MBFM)

HARVEST LEVEL	HARVEST VOLUME	LAST YEAR OF CUT	SPECIES GROUP	LOWER HARVEST LEVEL LIMIT	UPPER HARVEST LEVEL LIMIT
1	48000.0	2406	NCM	400.00	48000.00
			NDF	26600.00	48000.00
			NHM	3200.00	48000.00
			SCH	2500.00	48000.00
			SDF	2900.00	48000.00
			SHW	700.00	48000.00
			SMC	0.00	48000.00
			STF	0.00	48000.00
			PP	0.00	48000.00
			J	0.00	0.00

Numerous management activities and silvicultural treatments, can be developed and applied in various combinations, each combination defines a unique management regime. Polygons within a Sustained Yield Unit are assigned to a single, starting management regime. On completion of the management regime, or because of a specific harvest treatment, the polygon may return to the same management regime or continue under a new management regime.

Land and Resource Management Rules

In OPTIONS, resource management objectives can be applied as targets or constraints.

Targets and constraints can be applied to individual polygons or collectively to a group of polygons. Targets and constraints are applied for each year in the planning horizon, so all management objectives are maintained for every year within the planning horizon.

Targets are used to control conditions at the landscape level. For example, a target may be used to ensure that at any point in time 15% of the forested BLM ownership within a fifth field watershed will be in stands 80 years and older before regeneration harvest may occur. The model is flexible about which particular polygons are reserved to satisfy the target criteria. If current stand conditions do not achieve the target criterion the model will evaluate and recruit polygons that will contribute toward meeting the criterion soonest. Recruited polygons are deferred from harvest ensuring that the target criterion is met as soon as possible. Each year within the planning horizon, the model checks that sufficient polygons are available and deferred to meet the target criteria. The model only defers reserves enough polygons to meet the modeling targets, thus allowing non-deferred polygons to contribute toward meeting other management objectives.

Constraints set explicit limitations on the amount, or kind, of activities permitted for an individual polygon, portion of a polygon or across a group of polygons, for a defined period. The defined period can extend through the entire planning horizon, or it can be defined for a shorter timeframe. For example, constraints can be used to exclude regeneration harvest activities from a riparian area throughout the entire planning horizon, while allowing commercial thinning activities until the stand reaches an age of 80, after which no further treatments are permitted.

GIS Based Modeling Rules

Introduction

The attributes associated the GIS spatial data are used in OPTIONS to identify areas which modeling rules are applied to simulate the management action and land use allocations for the alternatives. This section will describe, by topic area, the modeling rules and GIS data as they were applied to simulate the alternatives with the OPTIONS model.

1) Sustained Yield Units (SYU) -

The BLM lands are subdivided into Sustained Yield Units for the purpose of defining the area which the allowable sale quantity will be based. The Sustained Yield Units are based on the BLM lands within the District boundaries for Salem, Eugene, Roseburg, Coos Bay, and Medford Districts. The western portion of the Klamath Falls Resource Area within the Lakeview District is also a SYU. The eastern portion of the Klamath Falls Resource Area does not contain any O&C lands and a sustained yield unit is not designated. The Forest Operations Inventory (FOI) District attribute data was used as the basis for the Sustained Yield Units in the OPTIONS modeling. The Land Use Allocation data segregated the Klamath Falls Resource into the Klamath SYU and the eastside management lands. An estimate of the sustainable harvest level was done for the eastside management lands under the No Action Alternative modeling assumptions. Allocations and management direction did not vary across alternatives for the eastside management lands and so they were not modeled in action Alternatives.

2) Non Forest -

Non forest areas in the OPTIONS model remain static in the projections and do not carry vegetation attributes. Non forest information was derived from multiple sources of GIS data to form the non forest class in the OPTIONS modeling.

- Transportation data buffered by 22.5 feet to simulate the road network.
- Timber Productivity Capability Classification non forest classes.
- Forest Operations Inventory Existing Stand Condition non forest class.
- In Alternatives 2 and 3 – open water class from the streams data.

3) Timber Productivity Capability Classification (TPCC)

- The TPCC inventory is described in detail in the Inventory Data section of this appendix. Common to all alternatives the non suitable woodlands and the suitable woodland categories of low site and non commercial species had no harvest modeled and were not included in the ASQ.

In the No Action Alternative the reforestation suitable woodlands had no harvest modeled and were not included in the ASQ. In the Action Alternatives these lands had harvest modeled and did contribute to the ASQ.

4) Recreation Sites -

In all Alternatives the existing recreation sites had no harvest modeled and were not included in the ASQ. In the Action Alternatives the proposed recreation sites had no harvest modeled and were not included in the ASQ. In the No Action Alternative the proposed recreation sites lands had harvest modeled and did contribute to the ASQ.

5) Wild and Scenic Rivers -

In all Alternatives the existing Wild and Scenic Rivers had no harvest modeled and were not included in the ASQ. In the Action Alternatives the eligible Wild and Scenic Rivers had no harvest modeled and were not included in the ASQ. In the No Action Alternative the eligible Wild and Scenic Rivers had harvest modeled and did contribute to the ASQ. In the No Action Alternative the existing recreation segments had harvest modeled and did contribute to the ASQ. (Note: not all recreation segments were able to be identified and put in the harvest land base)

6) Visual Resource Management (VRM) -

In all Alternatives the VRM class one had no harvest modeled and was not included in the ASQ. Under alternative 2, on the PD or acquired lands, no regeneration harvest was applied on VRM class two (Note: The VRM class one GIS data was only used in the No Action Alternative and Alternative 2. In the Action Alternatives the combination of the Wild and Scenic River and Congressionally Reserved covered this allocation.)

7) Areas of Critical Environmental Concern (ACEC) –

In the No Action Alternative all of the existing ACECs had no harvest modeled and were not included in the ASQ. The proposed ACECs had harvest modeled and did contribute to the ASQ. In the Action Alternatives all of the existing and proposed ACECs which passed through the O&C filter had no harvest modeled and were not included in the ASQ. Those ACECs which did not pass through the O&C filter had harvest modeled and did contribute to the ASQ.

O&C Filter - Used the following evaluation to determine how the each ACEC was modeled.

a) All ACECs which were Research Natural Areas (RNAs) had no harvest modeled and were not included in the ASQ.

b) For each of the Action Alternatives the districts reviewed the existing and proposed ACECs and designated them as:



- Whole ACEC does not conflict with the timber management objectives (On PD lands or on non commercial forest lands). These areas had no harvest modeled and were not included in the ASQ.
- A portion of the ACEC is in conflict with timber management but the portion of the ACEC outside of the O&C lands would remain as a valid ACEC. These portions of the ACECs that were not on O&C or CBWR lands had no harvest modeled and were not included in the ASQ.
- The entire ACEC conflicts with timber management objectives and is not carried forward under the alternative. These areas had harvest modeled and did contribute to the ASQ.

8) Marbled Murrelet Sites

Existing occupied marbled murrelet sites.

- No Action, and Alternative 1, these areas had no harvest modeled and were not included in the ASQ.
- Alternative 2 they became part of the Late-Successional Management Area which had thinning harvest modeled but this volume does not contribute to the ASQ.
- Alternative 3 had no harvest modeled until the landscape targets were met. In the modeling one decade after the landscape target were met these areas became available for harvest and they contributed to the ASQ. See the Assessment Area description for further information on the landscape targets and release dates.

The No Action Occupied Marbled Murrelet Site (OMMS) data was used to simulate the existing sites.

Projected future marbled murrelet sites.

Some alternatives have management action to limit harvest around marbled murrelet sites as they are identified. To simulate this in the modeling the stands which are 120 years and older that are within 4 townships from the coast were used as a surrogate.

- No Action and Alternative 1, for Coos Bay only, had no harvest modeled and were not included in the ASQ. The LSR / LSMA in Salem and Eugene encompassed the majority of the area within 4 townships of the coast so no simulation was needed.
- Alternative 2 had no projection for future sites.

- Alternative 3 had no harvest modeled until the landscape targets were met. In the modeling, one decade after the landscape target was met, these areas became available for harvest and they contributed to the ASQ. See the Assessment Area description for further information on the landscape targets and release dates.

9) Northern Spotted Owl

- No Action alternative had 100 acres known owl activity centers identified which had no harvest modeled and were not included in the ASQ.
- No Action Alternative had Reserve Pair Areas identified in the Salem district.
    - The suitable and next best reserved areas had no harvest modeled and were not included in the ASQ.
    - The dispersal, next best, and non-habitat received thinning only with no regeneration harvest. These lands had thinning harvest modeled but this volume did not contribute to the ASQ.
- Alternatives 1 and 2 no provisions for site management.
- Alternative 3 had 250 acre activity centers identified which had no harvest modeled until the landscape targets were met. In the modeling, one decade after the landscape target was met, these areas became available for harvest and they contributed to the ASQ. See the Assessment Area description for further information on the landscape targets and release dates.

10) Survey and Manage Species –

In the No Action alternative the survey and manage species sites had no harvest modeled and were not included in the ASQ.

11) Special Status Species –

In the action alternatives the special status species which were on Public Domain or Acquired lands had no harvest modeled and were not included in the ASQ.

12) Species Management Areas

- No Action alternative species management areas were identified for bald eagle, golden eagles, goshawk, and great grey owl sites. These areas had no harvest modeled and were not included in the ASQ.
- In the action alternatives the bald eagle sites had no harvest modeled and were not included in the ASQ.

13) Riparian

GIS Modeling

The riparian reserves / riparian management areas vary across the alternatives based upon the management action outlined in chapter two. GIS modeling was employed to estimate the extent of riparian areas so that management action could be simulated in the OPTIONS modeling. The GIS modeling, depending on the alternative, had many factors to consider in estimating the riparian area; presence/absence of fish, potential tree height adjusted specifically for each area, perennial versus intermittent streams, wetlands, lakes, ponds, and the potential to deliver large wood to streams. The description below is general in nature. The GIS metadata contains the technical details of the GIS riparian modeling.

- No Action Alternative and Alternative 1. GIS modeling varied the application of the site potential tree height based on district computed values usually by fifth field watershed. To determine the GIS buffering widths the potential tree heights were adjusted for the average stream side adjacent slope as determined by GIS analysis for each 5th field watershed. Attributes from the hydrography data were used to determine the presence and absence of fish, if a stream was intermittent or perennial, and the identification of ponds, wetlands and lakes. The GIS data for the OPTIONS modeling identified those areas in the riparian reserves as a Y/N classification.
- Alternative 2. Three riparian management area zones were identified with GIS buffering of the hydrography data. All fish bearing streams 0-25 feet (buf25). All non fish bearing intermittent 0-25 feet (shrub). Perennial and fish bearing 25-100 feet (buf100). GIS modeling was done to identify the areas likely to deliver large wood to streams which were identified in addition to the GIS buffering of the hydrography data (WDFLOW).
- Alternative 3. Four riparian management areas zones were identified with GIS buffering of the hydrography data. 0-25 feet on all streams. Within the Coquille tribal management area for all perennial streams and all intermittent streams with fish 25-50 feet. Within the Coquille tribal management area for all fish bearing streams 50-100 feet. Outside the Coquille tribal management area for all perennial streams and all intermittent streams with fish 25-100 feet.
- Alternative 2 and 3 riparian GIS analysis identified open water which was not recognized in the No Action and alternative 1 data. The open water was added to the other classes of non forest and not included in the riparian area in Alternatives 2 and 3.

OPTIONS Modeling Rules

In the OPTIONS modeling any harvest coming from the riparian areas does not contribute to the ASQ since the management action / modeling rules preclude continuous management. The shrub riparian area in Alternative 2 does contribute to the ASQ because these harvest practices can continue over time. Harvest levels are determined for these lands along for the duration which harvest can occur given the modeling rules.

Operability limitations were modeled by limiting thinning activities within each riparian polygon to a maximum of 50% of the polygon area. Additionally, riparian stand that were commercially thinned were then deferred from subsequent thinning treatments for 60 years. This deferral was applied to the entire polygon.

Table 296. Riparian modeling rules by alternative

Alternative	GIS Data	Riparian Modeling Rules
No Action	Y – Yes inside riparian reserve	• No regeneration harvest • Commercial thinning modeled up to age 80, in Salem Adaptive Management Areas up to age 110 • 50% operability by polygon
Alternative 1	Y – Yes, inside riparian management area	• No regeneration harvest • Commercial thinning modeled up to age 80. • 50% operability by polygon
Alternative 2	0-25 ft	• No harvesting activities modeled
	25-100 ft	• No harvest in stands 80 years and older. • No regeneration harvest modeled • Commercial thinning modeled up to age 80 • 50% operability by polygon
	Shrub	• Regeneration harvest modeled with 10-15 conifer green tree retention. (Contributes to ASQ)
	Wood Debris Flow Area	• No harvest activities modeled.
Alternative 2 Sub-Alternative Maximum Harvest	0-25 ft	• No harvest activities modeled.
Alternative 3	0-25 ft	• No harvesting activities modeled
	25-50 ft Coquille Management Area	• No harvest in stands 80 years and older. • No regeneration harvest modeled. • Commercial thinning modeled to age 80 • 50% operability by polygon
	50-100 ft Coquille Management Area	• No regeneration harvest modeled • 50% operability by polygon
	25-100 ft Outside Coquille Management Area	• No harvest in stands 80 years and older • No regeneration harvest modeled • Commercial thinning modeled to age 80 • 50% operability by polygon

14) Congressionally Reserved -

Congressionally reserved areas had no harvest modeled and were not included in the ASQ across all alternatives. The Land Use Allocation and Wild and Scenic Rivers GIS data was used to define these areas.

15) Late-Successional Reserves (LSR) -

The Late-Successional Reserves had only thinning harvests modeled in those stands less than 80 years of age for the No Action Alternative. This volume estimate is not included in the ASQ since the harvest would diminish over time as the stands eligible for thinning matured. The OPTIONS modeling projected the duration and volume levels for this harvest as it stepped down over time. The Land Use Allocation GIS theme was used to define this allocation. The other Northwest Forest Plan LSR components, Occupied Marbled Murrelet Sites and Know Owl Activity Centers, were modeled independently of the large block reserves. Also see the Adaptive Management Area Reserve section.

16) Late-Successional Management Areas (LSMA) -

Late-Successional Management Areas were defined for Alternatives 1 and 2.

- Alternative 1 LSMAs were based on the No Action alternative Late-Successional Reserves. Commercial thinning treatments within LSMA were consistent with the No Action LSR thinning treatments. Thinning was modeled in stands less than 80 years of age.
- Alternative 2 LSMAs were developed by BLM utilizing rules for size and spacing of large blocks which was based on current science for the Northern Spotted Owl and discussions from the draft Northern Spotted Owl recovery team. The initial GIS mapping of these large blocks was revised in the OPTIONS data preparation program to designate whole BLM parcels/sections based on a majority rule. In addition the existing Occupied Marbled Murrelet Sites were added to the LSMA. Commercial thinning treatments within LSMA were consistent with the No Action LSR thinning treatments. Thinning was modeled in stands less than 80 years of age.

Harvest projections for the LSMAs are not included in the ASQ estimates. With the absence of regeneration harvest, timber production from commercial thinning would diminish over time as the stands mature and become ineligible for thinning.

17) Adaptive Management Area and Late Successional Reserves –

Under the No Action alternative there are Adaptive Management Area designations which overlap the Late-Successional Reserves in the Salem

and Medford Districts. The Medford area was modeled the same as the Late-Successional Reserves, with thinning harvests limited to those stands less than 80 years of age. For the Salem area the thinning harvest was modeled up to age 110. Harvest projections for the areas are not included in the ASQ estimates. With the absence of regeneration harvest, timber production from commercial thinning would diminish over time as the stands mature and become ineligible for thinning. The OPTIONS modeling projected the duration and volume levels for this harvest as it stepped down over time. The Land Use Allocation GIS theme was used to define this allocation.

18) Adaptive Management Areas (AMAs) -

Adaptive Management Areas applied to the No Action Alternative. These are the portions of the AMA that exist outside Late-Successional Reserves.

- The AMAs in the Eugene and Roseburg, were modeled the same as General Forest Management Areas (GFMA).
- The Medford AMA was modeled the same the same as Southern General Forest Management Areas (S_GFMA).

The modeled harvest from these areas was included in the ASQ.

- The Salem AMA was modeled under thinning only, up through age 110, with no regeneration harvest. Since this harvest level would diminish over time the modeled volume was not included in the Allowable Sale Quantity.

Modeling reductions to the harvest land base for administratively withdrawn and riparian reserves within the AMAs was the same as within the surrounding matrix lands. The Land Use Allocation GIS layer was used to define this allocation.

19) Connectivity Diversity Blocks -

The connectivity diversity block allocations applied only to the No Action alternative. OPTIONS modeling rules were established so regeneration harvest will not occur until at least 25% of the forest area in the blocks was in stands 80 years or older. For each block a maximum of $1/150^{th}$ of the forested area could be at age zero (regenerated) to simulate the area control requirement. The modeling blocks were based on all of the connectivity diversity lands within a township and Sustained Yield Unit. The Land Use Allocation GIS layer was used to define this allocation on a gross basis. The net acreage modeled for harvest is the area remains after all other reductions to the harvest land base have been made. The modeled harvest from these areas was included in the ASQ.

20) General Forest Management Areas (GFMA) -

The GFMA allocation applied only to the No Action alternative. The Southern GFMA in the Medford District and the Klamath Falls SYU has older minimum harvest ages and higher green tree retention than the GFMA allocations in the other SYUs. The Land Use Allocation GIS layer was used to define this allocation on a gross basis. The net acreage modeled for harvest is the area remains after all other reductions to the harvest land base. The modeled harvest from these areas was included in the ASQ.

21) Timber Management Area (TMA) -

The TMA allocation applied to Alternatives 1 and 2. On a gross basis these are the lands outside of the Late-Successional Management Area, Riparian Management Area, Congressionally Reserved, and the Monument. The net acreage modeled for harvest is the area which remains after all other reductions to the harvest land base. The modeled harvest from these areas was included in the ASQ.

22) General Landscape Area (GLA) -

The GLA allocation applied to Alternative 3. On a gross basis these are the lands outside of the Riparian Management Area, Congressionally Reserved, and the Monument. The net acreage modeled for harvest is the area which remains after all other reductions to the harvest land. The modeled harvest from these areas was included in the ASQ.

23) District Defined Reserves -

Under the No Action Alternative there are district defined reserves that were established in the 1995 RMP. These lands are defined in the Land Use Allocation GIS layer. No harvest was modeled for these areas and they were not included in the ASQ.

24) Miscellaneous District No Harvest Areas -

Under all alternatives individual OI units were earmarked by the districts to be excluded from the harvest land base for modeling. These included communications sites, seed orchards, and some omissions in the TPCC data for Klamath Falls. No harvest was modeled for these areas and they were not included in the ASQ.

25) Wilderness Characteristics -

Under the action alternatives wilderness characteristics areas were identified in GIS. Only those lands which fell on Public Domain were

considered in the modeling. For those areas no harvest was modeled for these and they were not included in the ASQ.

26) Medford Granitic Soils -

For the No Action Alternative the areas identified in GIS for the Medford district as granitic soils in the Northern General Forest management Areas were modeled under the southern General Forest Management Areas prescriptions.

27) Medford Frost Areas -

For the No Action Alternative the areas identified in GIS for the Medford district as frost areas called for developing unique prescriptions to establish shelterwood prescriptions to retain trees for 30 years. The area was 8,000 acres in size. Due to the small size and complexity of modeling this no specific modeling was done for this area.

28) Medford Deferred Watersheds -

The Medford district 1995 RMP identified a set of monitoring watersheds which were deferred from harvest for one decade.

- In the No Action Alternative these areas had no harvest modeled for 1 decade. After that these areas would have harvest modeled according to the underlying land use allocation and contribute to the ASQ. There was a GIS data issue that one watershed was included that was not intended to be deferred and another was omitted. Overall the modeling was 500 acres short on modeling this deferral.
- In Alternative 1 these watersheds were modeled as completely deferred with no harvest activities simulated. These lands did not contribute to the ASQ. The GIS data was corrected from the No Action dataset.

29) 15% Standard and Guideline (15% S&G) -

The 15% S&G was modeled in the No Action Alternative. The OPTIONS model did not conduct any regeneration harvest until 15% of the forest area with in each fifth field (with in the SYU) was in stands 80 years or older. This constraint was enforced annually, prohibiting watersheds from going below the threshold. Thinning treatments were modeled irrespective of the 15% S&G status. Harvest in these areas does or does not contribute to the ASQ depending on the underlying land use allocation.

30) Swiss Needle Cast Area -

The Salem district identified the current extent of the Swiss needle cast infection exists. The OPTIONS model used a unique set of species groups to reflect the reduced yields of existing stands or the future growth and yields of disease resistant species mixes in the existing infection area.

31) Alt 3 Assessment Areas – Landscape Targets -

A review of the age which the OPTIONS projection achieved Northern Spotted Owl habitat (category 4) was conducted for each province / SYU. From this review age 90 years or 140 years thresholds were established for each province / SYU for use as the landscape targets. Assessment areas were established based on the combination of province / SYU which were outside of the Uneven-aged management area in Medford and Klamath Falls and the Coquille Tribal management area. In OPTIONS regeneration harvest was not modeled until 50% of the forest area in each assessment area was above the landscape target age. Partial harvest and commercial thinning were modeled for the entire projection period independent of the landscape targets and assessment areas. Marbled Murrelet Sites and Northern Spotted owl sites were modeled as no harvest until one decade after the landscape targets were met. At that time those lands were available for harvest.

Table 297. Alt 3 Landscape Areas, Habitat Threshold Ages and Assessment Area Names

Alt 3 Landscape Areas, Habitat Threshold Ages and Assessment Area Names				
	Cascades	Coast	Klamath	Total (acres)
Coos Bay		269,634	51,533	321,166
Threshold Age		90 Years	90 Years	
Assessment Area		CB Coast / Coquille	CB Klamath	
Eugene	151,974	160,286		312,261
Threshold Age	90 Years	90 Years		
Assessment Area	Eug Cascades	Eug Coast		
K-Falls	51,306			51,306
Threshold Age	n/a			
Assessment Area	Uneven Age			
Medford	229,873		636,819	866,692
Threshold Age	140 Years & n/a		140 Years & n/a	
Assessment Area	Med Cascades & Uneven Age		Med Klamath & Uneven Age	
Roseburg	152,313	129,039	142,236	423,588
Threshold Age	90 Years	90 Years	140 Years	
Assessment Area	Ros Cacades	Ros Coast	Ros Klamath	
Salem	170,027	232,157		402,184
Threshold Age	90 Years	90 Years		
Assessment Area	Sal Cascades	Sal Coast		

32) Coquille Tribal Management Area

The Coquille Tribal Management Area was modeled in Alternative 2 and 3. No northern spotted owl site harvest constraints were applied in this area under both alternatives. Under Alternative 3 the landscape targets were not applied which limited regeneration harvest. See Riparian section for Alternative 3 modeling for the riparian area. The TMA/ GLA lands were modeled under the No Action GFMA prescription.

GIS Data – Modeling Harvest and Contribution to ASQ

The Table below provides a summary of how each category of GIS data was modeled and which categories contribute to the Allowable Sale Quantity.

Table 298. GIS Modeling Data Categories

GIS Modeling Data Categories	No Action	Alternative 1	Alternative 2	Alternative 3
Roads	X	X	X	X
TPCC Non Forest	X	X	X	X
TPCC Non Suitable Woodlands	N	N	N	N
TPCC Suitable Woodlands - Low Site and Non Commercial Species	N	N	N	N
TPCC Suitable Woodlands - Reforestation	N	Y	Y	Y
Recreation Sites Existing	N	N	N	N
Recreation Sites Proposed	Y	N	N	N
Wild and Scenic Rivers - Existing	N	N	N	N
Wild and Scenic Rivers - Eligible	Y	N	N	N
Visual Resource Management Class 1	N	N	N	N
Areas Of Critical Environmental Concern - Existing	N	N – If Passes O&C Filter	N –If Passes O&C Filter	N – If Passes O&C Filter
Areas Of Critical Environmental Concern - Proposed	Y	N – If Passes O&C Filter	N – If Passes O&C Filter	N – If Passes O&C Filter
Occupied Marbled Murrelet Sites	N	N	N	D
Simulation Future Marbled Murrelet Sites	N	N	N	D
Known Owl Activity Centers	N - 100 Acres	Y	Y	D - 250 Acres
Reserve Pair Areas (Salem)	N	N/A	N/A	N/A
Survey and Manage Species	N	N/A	N/A	N/A
Special Status Species	N/A	N - For Those On PD Lands	N - For Those On PD Lands	N - For Those On PD Lands
Species Mangement Areas	N	N - For Eagle Sites	N - For Eagle Sites	N - For Eagle Sites
Riparian Reserves	P	N/A	N/A	N/A
Riparian Mangement Areas	N/A	P	P	P
LUA - Congressionally Reserved	N	N	N	N
LUA - Late-Successional Reserves	P	N/A	N/A	N/A
LUA - Late-Successional Management Areas	N/A	P	P	N/A
LUA - Adaptive Management Areas	Y/P	N/A	N/A	N/A
LUA - Adaptive Management Areas/Reserves	P	N/A	N/A	N/A
LUA - Connectivity Diversity Blocks	Y	N/A	N/A	N/A
LUA - General Forest Management Areas	Y	N/A	N/A	N/A

LUA - Southern General Forest Management Areas	Y	N/A	N/A	N/A
LUA - Timber Management Area	N/A	Y	Y	N/A
LUA - Gen Landscape Area	N/A	N/A	N/A	Y
LUA - District Defined Reserves	N	N/A	N/A	N/A
Misc. District No Harvest Areas	N	N	N	N
Wilderness Characteristics on PD Lands	Y	N	N	N
Medford Deferred Watersheds	D	N	N/A	N/A
15% Standard & Guide	D	N/A	N/A	N/A

- Y = Harvest is modeled and contributes to ASQ
- P = Harvest is modeled but does not contribute to ASQ since the harvest can not be sustained continuously over time.
- N = No harvest is modeled.
- D = Harvest is deferred for 1 or more decades and contributes to ASQ.
- X = Non Forest
- N/A = Does not apply to the alternative

Sub Alternatives & Benchmark Analysis Modeling Rules

Sub Alternative Analysis

1) **Alternative 1 with No harvest of stands 200 years and older**. All existing Forest Operations Inventory units with a stand age of 200 years or older were modeled as not available for harvest.

2) **Alternative 1 with No harvest of stands 80 years and older**. All existing Forest Operations Inventory units with a stand age of 80 years or older were modeled as not available for harvest.

3) **Alternative 1 with No Regeneration Harvest until Thinning Opportunities were Depleted** – Thinning was given the highest priority in requested volume.

4) **Alternative 1 adding Northern Spotted Owl (NSO) Critical Habitat to the Late-Successional Management Area (LSMA).** The GIS data for NSO critical habitat was added to the LSMA allocation and modeled under those rules.

5) **Alternative 2 Short Rotation** - The objective was to mimic industrial forestry practices within the Timber Management Area minimum harvest ages were set to approximate the general range of harvest ages displayed in Figures 6.1, 6.3 and 6.4 of PNW GTR-633. Within the OPTIONS model, no commercial thinning was applied to the Timber Management Area for this sub-alternative.

6) **Alternative 3 – Low Government Ownership.** Those BLM sections or parcels of land which were in areas that were in less than 50% (based on a roving 25 square mile circle) in State or Federal Ownership were identified as low government ownership. For these lands no landscape target (50% of assessment area in stands 90/140 years of age) was applied. The assessment areas for the high government lands were changed to the entire SYU, excluding the uneven aged management area and Coquille management area. This change was made because the exclusion of the low ownership areas from the assessment areas made for illogical variable sized assessment areas.

Table 299. Alt 2 Short Rotation Subalternative - Minimum Harvest Ages by Species Group and Site (Productivity) Class

Alt 2 Short Rotation Subalternative - Minimum Harvest Ages by Species Group and Site (Productivity) Class						
W. Hemlock Zone	**Douglas-fir & Tanoak Zones**					
Species	**Species**	**Forest Maturity Criteria**				
Group	Group	SP5	SP4	SP3	SP2	SP1
HNCM	ONCM	60	55	50	45	40
HNDF	ONDF	60	55	50	45	40
HNHM	ONHM	60	55	50	45	40
HSCH	OSCH	70	65	60	55	50
HSDF	OSDF	70	65	60	55	50
HSHW	OSHW	70	65	60	55	50
HSMC	OSMC	70	65	60	55	50
HSTF	OSTF	80	75	70	65	60
HPP	OPP	80	75	70	65	60
J	J					
NF	NF					
ROAD	ROAD					
SSCH	SSCH					
SSDF	SSDF					
SSHW	SSHW					
SSMC	SSMC					
SSTF	SSTF					
SPP	SPP					
SJ	SJ					
HCNCM	OCNCM	60	55	50	45	40
HCNDF	OCNDF	60	55	50	45	40
HCNHM	OCNHM	60	55	50	45	40

Reference Analysis

1) Maximum Harvest –

The Alternative 2 data was used for this analysis. All lands were made available for harvest with the exception of ; TPCC Non Suitable Woodlands, TPCC Suitable Woodland (low site and non commercial speeies), Wild and Scenie Rivers, existing recreation sites. 25' buffer on streams (buf_25), Congressionally Reserved lands, and the National Monument. CMAI was used in setting the minimum harvest ages similar to Alternative 2.

2) No Harvest –

No harvest was simulated.

Green Tree Retention

No Action Alternative

Green Tree Retention (GTR) was modeled as a stand level constraint in the No Aetion Alternative. Within eaeh polygon a retention level was applied at the time of harvest. Retention levels varied by land use allocation as presented in Table 300.

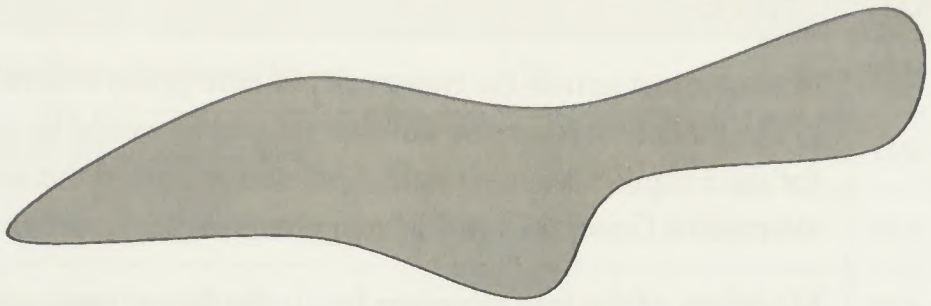
Table 300. Green tree retention percent by land use allocation for the No Action analysis

Land Use Allocation	Green Tree Retention Percent
General Forest Management Area (GFMA), North GFMA, Adaptive Management Areas, No Designation	11%
South General Forest Management Area (including Granitic Soils Areas)	24%
Connectivity Diversity Blocks, District Defined Reserves, Congressionally Reserved, National Monument	18%
Late Successional Reserves, Adaptive Management Area Reserves	Not Applicable
Eastside Management Lands	Not Applicable

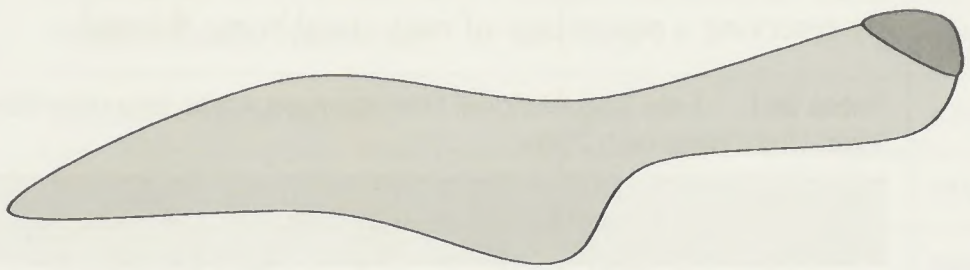
The retained portions of the polygons were modeled as contiguous areas and reserved until a subsequent rotation when the areas were made available for harvest and GTR retention was applied. Thus, in each subsequent harvest a smaller portion of the original retention area was reserved while younger GTR areas were also retained.

The figure below provides a graphic example of modeling 11% green tree retention. In the model the retention areas is not spatially defined with in the polygon but is tracked as a proportion of the area.

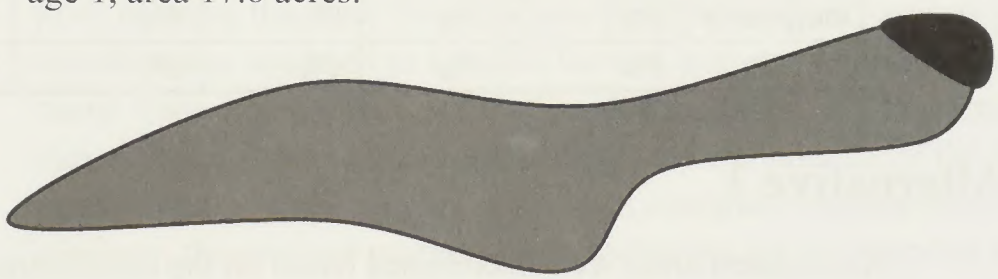
Figure 344. Green tree retention accounting within the OPTIONS model.



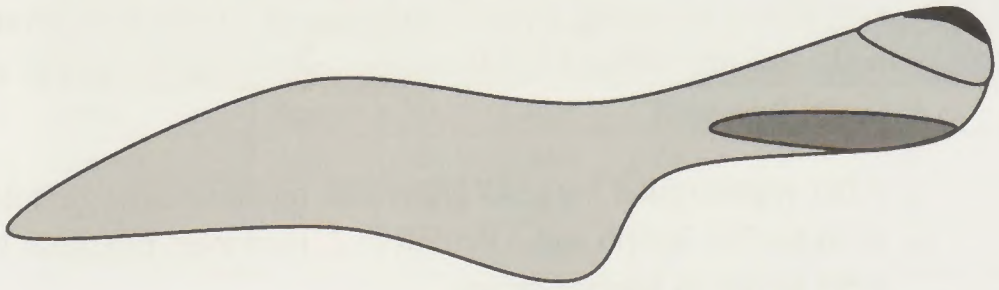
Polygon prior to first harvest. Stand age 100 years. Area 20 acres.



Polygon after first harvest. Retention stand age 101, area 2.2 acres; regeneration age 1, area 17.8 acres.



Polygon prior to second harvest. Retention stand age 181, area 2.2 acres; regeneration age 81, area 17.8 acres.



Polygon after second harvest. Oldest retention stand age 181, area 0.24 acres; younger retention stand age 81, area 1.96 acres; regeneration age 1, area 17.8 acres.

Alternative 1

No green tree retention was applied in Alternative 1

Alternative 2

Management action for two trees per acre green tree retention was not simulated in the modeling since the volume reduction would be minor. Green tree retention for the Coquille Management Area was modeled the same as the No Action alternative General Forest Management Area.

Modeling of the tree retention levels for future snags and coarse woody debris in the Late-Successional Management Areas varied individual SYUs and physiographic provinces. This retention was modeled as a stand level constraint by reserving a percentage of each stand being thinned.

Table 301. Late Successional Management Areas tree retention percent by Sustained Yield Unit / Retention Zone.

Retention Zone	Lakeview	Salem	Eugene	Roseburg	Medford	Coos Bay
Western Hemlock	0%	7%	8%	14%	0%	8%
Douglas-fir	9%	0%	0%	8%	12%	0%
Tan Oak	9%	0%	0%	0%	13%	5%

Alternative 3

Assessment areas were established based on the combination of province / SYU which were outside of the Uneven-aged management area in Medford and Klamath Falls and the Coquille Tribal management area. Age thresholds (90 yr or 140 yr) were established as landscape target for each assessment area. (See GIS Based Modeling Rules – Assessment Areas) Regeneration harvests were not modeled until 50% of the Assessment Area was in ages at or above the landscape target threshold.

After regeneration harvests green tree retention was modeled in a similar manner as in the No Action and Alternative 2. However, retention levels for Alternative 3 were based on species group.

Table 302. Regeneration harvest percent volume tree retention for green tree, snag, and coarse woody debris creation by species group.

Species Group	Green Tree Retention Percent	Green Tree + Future Snag and CWD
Northern Hardwood Mixed	7%	15%
Northern Mixed Conifer	6%	14%
Northern Douglas-fir	6%	14%
Southern Douglas-fir	7%	10%
Southern Mixed Conifer	8%	12%
Sothern Conifer Hardwood	10%	13%
Southern Hardwood	9%	13%
Southern True Fir	8%	11%
Ponderosa Pine	15%	24%

In Alternative 3 intermediate harvests, termed partial harvests, were permitted prior meeting the older forest targets. For intermediate harvests green tree retention was modeled as a partial harvest, and stand attributes of the retained stems were incorporated into the blended yield curves. The blended yield curves reduced the retained and regenerated components of the harvest unit proportionally, similar to the stand level constraint method described above, however, the retained portions of the polygons are not reported independently.

Table 303. Stand treatment age and retention used to blend yield curves for intermediate harvests.

	1st Intermediate Harvest		2nd Intermediate Harvest		3rd Intermediate Harvest		4th Regeneration Harvest	
Zone	Age	%	Age	%	Age	%	Age	%
Hemlock	120	35	240	35	0	0	360	n/a
Douglas fir	80	19	160	19	0	0	240	n/a
Tanoak	60	35	120	35	180	35	240	n/a

Table 304. Partial Harvest Retention plus Supplemental Retention for Snag and Coarse Woody Debris Creation

	1st Intermediate Harvest		2nd Intermediate Harvest		3rd Intermediate Harvest		4th Regeneration Harvest	
Zone	Age	%	Age	%	Age	%	Age	%
Hemlock	120	42	240	42	0	0	360	*
Douglas fir	80	22	160	22	0	0	240	*
Tanoak	60	39	120	39	180	39	240	*

* GTR levels by Species Group

The Coquille Management Area was modeled the same as the No Action General Forest Management Area.

Scribner Volume

For OPTIONS modeling, Scribner volumes were generated as a part of the guide curve modeling with the ORGANON Shell. The equations for these volumes are based 16-foot BLM volume rules.

Volume Adjustments

Guide Curve Adjustments to volume were made for Defect and Breakage (D&B), Green Tree Retention (GTR), Snags, Coarse Woody Debris (CWD), Insect and Disease, and Soil Compaction

With the exception of GTR, all adjustments to the Guide Curves were compiled outside the OPTIONS model as percent basal area reductions. Estimates for D&B, Insect and Disease, and Soil Compaction were supplied by the districts or based on values derived for the most recent RMP. Guidelines for Snags and Coarse Woody Debris (CWD) varied by alternative. These adjustments were made to the Guide Curves with the OPTIONS data preparation program and applied within the OPTIONS modeling as volume reductions. Adjustments were compiled and applied by ORGANON variant, Species Group, stand type (managed, unmanaged, or future) and harvest type where appropriate. For Alternative 3, these adjustments were further stratified by Vegetation Zone; Western Hemlock, Douglas-fir and Tanoak to account for differences in Snag and Coarse Woody Debris requirements.

Figure 345. An example of adjustments utilized for a single alternative and district.

Alternative 3 Yield Adjustments - Factors Varying by Management Status and Retention Zone

District: Roseburg
Alternativ Alt 3
ESC/Modeling Grou MG11&15=Unmanaged
Land Use Allocation: GLA

Regen Harvest Age	Soil Compac-tion	Insect & Disease	Cruise Gross to Net [D&B]	GTR Edge Effect	Sum of Adjust-ments	Final Adjustment Factor Managed & Future	Final Adjustment Factor Unmanaged (w/o Soil I&D)	GTR Green Tree Retention %BA Adj for Regen Harvest Only: WH Retention Zone GTR %BA	DF Retention Zone GTR %BA	TO Retention Zone GTR %BA	Snag Creation/Retention %BA Adj for Partial & Regen Harvest: WH Retention Zone Snag %BA	DF Retention Zone Snag %BA	TO Retention Zone Snag %BA	CWD %BA Adj for Partial & Regen Harvest: WH Retention Zone CWD %BA	DF Retention Zone CWD %BA	TO Retention Zone CWD %BA
30	0.00	0.005	0.050	0.050	0.105	0.895	0.900	0	0	0	0	0	0	0	0	0
40	0.00	0.007	0.050	0.050	0.107	0.893	0.900	0	0	0	0	0	0	0	0	0
50	0.00	0.008	0.050	0.050	0.108	0.892	0.900	0	0	0	0	0	0	0	0	0
60	0.00	0.010	0.050	0.050	0.110	0.890	0.900	0	0	0	0	0	0	0	0	0
70	0.00	0.011	0.050	0.050	0.111	0.889	0.900	0	0	0	0	0	0	0	0	0
80	0.00	0.012	0.050	0.050	0.112	0.888	0.900	0	0	0	0	0	0	0	0	0
90	0.00	0.014	0.050	0.050	0.114	0.886	0.900	0	0	0	0	0	0	0	0	0
100	0.00	0.015	0.060	0.050	0.125	0.875	0.890	0	0	0	0	0	0	0	0	0
110	0.00	0.016	0.070	0.050	0.136	0.864	0.880	0	0	0	0	0	0	0	0	0
120	0.00	0.018	0.080	0.050	0.148	0.852	0.870	0	0	0	0	0	0	0	0	0
130	0.00	0.019	0.090	0.050	0.159	0.841	0.860	0	0	0	0	0	0	0	0	0
140	0.00	0.020	0.090	0.050	0.160	0.840	0.860	0	0	0	0	0	0	0	0	0
150	0.00	0.022	0.090	0.050	0.162	0.838	0.860	0	0	0	0	0	0	0	0	0
160	0.00	0.023	0.100	0.050	0.173	0.827	0.850	0	0	0	0	0	0	0	0	0
170	0.00	0.024	0.110	0.050	0.184	0.816	0.840	0	0	0	0	0	0	0	0	0
180	0.00	0.026	0.120	0.050	0.196	0.804	0.830	0	0	0	0	0	0	0	0	0
190	0.00	0.027	0.130	0.050	0.207	0.793	0.820	0	0	0	0	0	0	0	0	0
200	0.00	0.028	0.200	0.050	0.278	0.722	0.750	0	0	0	0	0	0	0	0	0
210	0.00	0.028	0.200	0.050	0.278	0.722	0.750	0	0	0	0	0	0	0	0	0
220	0.00	0.028	0.200	0.050	0.278	0.722	0.750	0	0	0	0	0	0	0	0	0
230	0.00	0.028	0.200	0.050	0.278	0.722	0.750	0	0	0	0	0	0	0	0	0
240+	0.00	0.028	0.200	0.050	0.278	0.722	0.750	0	0.083	0.074	0	0.012	0.018	0	0.028	0.035
360+	0.00	0.028	0.200	0.050	0.278	0.722	0.750	0.065	0.083	0.074	0.030	0.012	0.018	0.043	0.028	0.035

Exceptions to these were limited to the modeling of GTR for Regeneration harvests in the No Action Alternative and Alternative 3 and the Partial harvests in Alternative 3. These reductions were taken at time of harvest within the OPTIONS model in the form of a reduced harvest unit acreage.

Minimum Harvest Age

The OPTIONS model uses a minimum harvest age to control the lower limit where regeneration harvest can occur.

In the No Action Alternative the minimum harvest ages were set by direction in the current plans. For all districts, except Medford, the minimum regeneration harvest age was set to 60 years. For the Medford district, the minimums were 100 years in the North General Forest Management Areas and 120 years in the South General Forest Management Areas.

For alternatives 1 and 2 minimum harvest ages were based on Culmination of Mean Annual Increment (CMAI) for regeneration harvests.

Culmination of Mean Annual Increment (CMAI) results can vary widely depending on the unit of measurement used, the utilization standards and whether net or gross growth is considered. It has been a commonly accepted forestry theorem that even- aged stands should be harvested at CMAI in order to maximize biological yields.

Current Annual Increment (CAI) is defined as the annual increment of wood grown for a particular stand, or in this case a group of inventory plots representing similar growing

conditions. Mean Annual Increment (MAI) for a particular stand or set of plots is the total increment of wood at a given stand age divided by that stand age. CMAI is the point when the CAI, sometimes termed Periodic Annual Increment (PAI) and the MAI are equal. Culmination occurs when the maximum MAI is reached. From the ORGANON Guide Curve runs, Total Stem Cubic Volume (TSCV) was used for CMAI determination. This approximates a biological decision rule for the point of harvest. For this evaluation, the CMAI threshold was assumed to be the first age (5-year ORGANON modeling cycle) at which the difference between PAI and MAI was zero or negative. The gross volume CMAI statistics generated from ORGANON were adjusted to approximate net volume CMAI and allow the OPTIONS modeling greater flexibility in harvest scheduling.

In Alternative 1 and 2 the OPTIONS minimum harvest age was set at the 90% level of CMAI to give the model a reasonable level to vary from the estimated values.

Table 305. Forest Maturity Criteria - Proposed Minimum Harvest Ages at 90% CMAI by Species Group and Site (Productivity) Class

Forest Maturity Criteria - Proposed Minimum Harvest Ages at 90% CMAI by Species Group and Site (Productivity) Class					
Species	Productivity Classes				
Group	SP5	SP4	SP3	SP2	SP1
NCM	110	105	95	95	85
NDF	110	95	85	85	75
NHM	95	95	85	80	80
SCH	155	120	110	110	110
SDF	140	120	110	105	100
SHW	155	120	110	110	110
SMC	155	120	110	110	110
STF	145	140	120	120	120
PP	140	115	115	115	115
SSCH	155	120	110	110	110
SSDF	140	120	110	105	100
SSHW	155	120	110	110	110
SSMC	155	120	110	110	110
SSTF	145	140	120	120	120
SPP	140	115	115	115	115
CNCM	130	110	95	90	85
CNDF	130	110	95	90	85
CNHM	130	110	95	90	85

For Alternative 3 minimum both partial harvest and regeneration harvest minimum harvest ages were established in the management action.

Table 306. Alternative 3 Minimum Stand Treatment Ages for Partial and Regeneration Harvests

	1st Partial Harvest	2nd Partial Harvest	3rd Partial Harvest	Regeneration Harvest
Zone	Stand Age (years)	Stand Age (years)	Stand Age (years)	Stand Age (years)
Hemlock	120	240	0	360
Douglas fir	80	160	0	240
Tanoak	60	120	180	240

Modeling Thinnings

Commercial thinning modeling criteria were derived from two sources.

- Simulation rules for management action for an alternative.

  Example - Modeling "caps' were used to limit commercial thinning in Late-Successional Reserves to stands less than 80 years to simulate the plan requirement to only apply treatments that would promote the development of late-successional forest.

- Growth and yield team's results for the ORGANON modeling of existing and future stands.

  ORGANON modeling determined the timing, extent and number of treatments which were specific to modeling groups. The lower and upper treatment ages, treatment intensity and the number of treatments along with modeling criteria, targets and guidelines are documented under the Forest Growth and Yield Modeling section.

The Treatment Response approach allows the OPTIONS model to adjust for the total growth in the thinned stand by modifying the growth rate (slope) of the Guide Curve for the untreated stand. The growth rate is adjusted such that the ORGANON modeled growth response of the treated stand, i.e. the increase in volume growth at the end of the treatment response period, is approximated within the OPTIONS modeling for that particular stand type and a specific thinning treatment For use in the OPTIONS model, the commercial thinning treatment results, for each modeled combination of Species Group(s), Productivity Class(es) and thinning entry number (1st, 2nd, 3rd…) were subsequently analyzed to determine a "Treatment Response". Treatment Response Period was defined as 30 years or the number of years between modeled thinning entries, whichever was less.

Within the OPTIONS model, the thinning availability window was set in all alternatives to 5 years prior and 15 years after the ORGANON modeled treatment age for a specific stand type. If, within the OPTIONS model, a particular vegetation polygon was not thinned during a treatment window, the opportunity for the model to apply that specific commercial thinning treatment was foregone. If that particular stand was modeled for

subsequent thinning treatments at older ages, it became available for treatment evaluation like any other stand regardless of whether the previous treatment was applied.

Before the OPTIONS model can apply a commercial thinning treatment to a particular stand, the current stand attributes are reviewed to insure that the prescribed removal will meet the minimum per acre harvest targets. The minimum targets were – Salem Roseburg, Coos Bay – 8,000 board feet per acre, Eugene – 6,000 board feet per acre, Medford 4,000 board feet per acre, and Klamath Falls 2,000 board feet per acre. If the residual stand criteria cannot be met, the stand will be left to grow and re-evaluated in subsequent years as long as it remains within the treatment window or until the treatment is applied. Since all the existing stands were assigned an imputed stand attributes, not the average guide curve values, some lower-stocked stands which can not meet the minimum post-harvest criteria may be left to grow. Depending on the stand, the priority for commercial thinning in a particular alternative and the harvest related criteria described above, stands may or may not receive treatment.

Harvest Priorities

Within the OPTIONS model the source of harvest volume could be prioritized by three categories of "Wood Type" were defined and held constant across all alternatives.

- Older Forest – Regeneration harvest stands 200 years and older.
- Second Growth – Regeneration harvest of stands less than 200 years.
- Thinning – All thinning, intermediate, or partial harvests.

Within the model, Wood Types are assigned priorities 1 through 3, with 1 being the highest and 3 the lowest priority for harvest.

Within each Wood Type a lower and an upper harvest request limit can be designated.

An overall harvest volume is established in the Model as a maximum harvest level for any one year. The model will then attempt to satisfy the first priority Wood Type lower harvest request. Then do the same with the other two Wood Type priorities. After the lower harvest limits have been, to the extent possible, implemented across all three Wood Types, the model goes through the Wood Types by priority to satisfy any upper limit of harvest requests. If the upper harvest limit can not be satisfied in the first wood type priority then it proceeds to the next wood type priority until it attains the over all harvest level requested.

These lower and upper limits for each wood type can be modified for specific time periods of the projection.

These harvest priority controls can be used to control the rate of harvest in a particular Wood Type as well as balancing the levels of harvest across wood types.

Establishing Harvest Levels

OPTIONS modeling projections occur in increments of 1 year. Thus, all management objectives were maintained, and requested harvest levels met, in each year of the planning horizon. The planning horizon for all analyses was 100 years, although the final ASQ harvest level for each alternative was tested at 400 years to ensure its long-term sustainability. The sustainability analyses were subject to the same criteria as the 100 year analyses.

Harvest volume projections are based on the lands available for harvest, under the assumptions of the alternative within each sustained yield unit. Those lands which contribute to the ASQ can be managed over an extended period of time to provide a sustainable non declining level of harvest. Harvest from reserves (Late-Successional Reserves / Management Areas and or Riparian Reserves / Management Areas) will diminish as stands grow past the conditions suitable for thinning and will not produce a sustainable harvest over time.

The sustainable harvest level from the land base supporting the ASQ was modeled separately from that harvest which can be derived from the reserves. Segregating the landbase and modeling of harvest volume in this manner isolated the interaction of these two types of allocations.

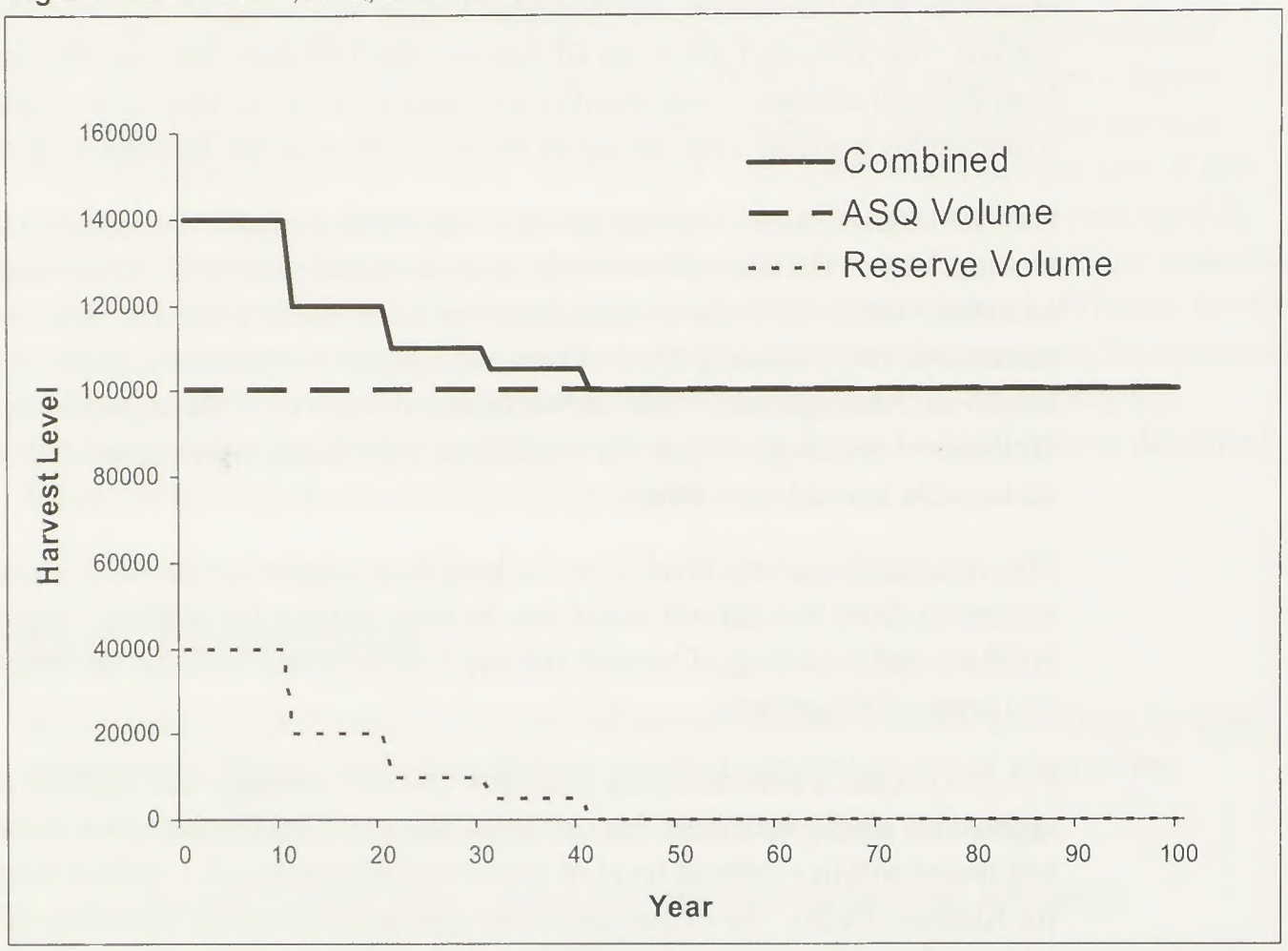
For ASQ lands, a non-declining even flow (NDEF) strategy was applied. Based on this approach a single maximum harvest level was modeled for the entire planning horizon and tested within a defined level of precision (increments of 1 million board feet, 0.1 for Klamath Falls). The exception to this approach was in the modeling of Alternative 3 where a future increase in the ASQ harvest levels were determined after landscape targets were achieved for an entire Sustained Yield Unit (SYU).

Generally, reserve lands permitted limited management activities and had a limited period of availability. The NDEF strategy was not an appropriate method of modeling these areas so an uneven flow strategy was applied. Reserve lands only provided timber within the short-term (within the first 80 to 100 years, depending on the alternative), so a 'stair-stepped' method was used to characterize and report partial harvest volume. With this approach a maximum harvest volume for each 10-year period was determined.

A combined ASQ and reserve land OPTIONS run was performed for the production of the Ten Year Scenario, Northern Spotted Owl Habitat Projections, Structural Stage Projections and other post processing reporting. A maximum harvest level of the larger combined harvest landbase was not modeled. The total harvest volume modeled was the simple sum of the ASQ and reserve harvest volumes, although the reserve harvest volume amount was first reduced by 20% to approximate operational fall down. A maximum harvest volume level of the larger combined harvest levels landbase was not tested modeled. The overall thinning harvest level in terms of acres and volume matched the combined request but the proportions coming from inside and outside reserves was not controlled in the combined run. This appeared in Alternative 3 where a very small amount of riparian thinning (2 MMBF out of 473 MMBF total) was requested in the combined run but none if occurred in the riparian areas.

The Figure below is an example of non-deelining ASQ harvest volume, stair-stepped reserve harvest volume and eombined harvest volumes.

Figure 346. Reserve, ASQ, and Total Volume..



Creating Blended Yield Curves for Alternative 3

Alternative 3 included rules that exeluded regeneration harvests until older forest retention target thresholds were achieved. Additionally, within each landscape unit intermediate harvests with high levels of green trees were retention were permitted prior to achieving the landscape target levels of older forests.

Table 307. Stand treatment age and percent retention used to blend yield curves for intermediate harvests.

	1st Intermediate Harvest		2nd Intermediate Harvest		3rd Intermediate Harvest		4th Intermediate Harvest	
Zone	Age	%	Age	%	Age	%	Age	%
Hemlock	120	35	240	35	0	0	0	0
Douglas-fir	80	19	160	19	240	19	0	0
Tanoak	60	35	120	35	180	35	240	35

In the other alternatives, yield curves were developed by the growth and yield team with the Organon model. However, the high retention levels of the intermediate harvests in Alternative 3 presented a modeling ehallenge for Organon. Investigation by the growth and yield specialists revealed that in the

ORGANON model, it would be difficult to develop an appropriate set of tree data to represent the multi-storied character of the intermediate harvests. As an alternative, a simple mathematical approach was considered a suitable technique for developing the blended guide curves for the multi-storied stand conditions resulting from intermediate harvests. It was recognized that this approach does not account for the treatment, competition or edge effects of the intermediate harvest. The blending process was applied to the Organon stand summary table for the OPTIONS analysis, and for the Organon detailed stand tables for use with the Northern Spotted Owl habitat index and structural stage classification.

This mathematical approach involved combining (or blending) the yield curve of the untreated portion of the stand with the yield curve of the treated portion of the stand. The 'blending' technique apportioned basal area, volume and density based on the retention level of the intermediate harvest. Stand height and diameter were not blended. These attributes were based wholly on the yield curves for the treated portion of the stand.

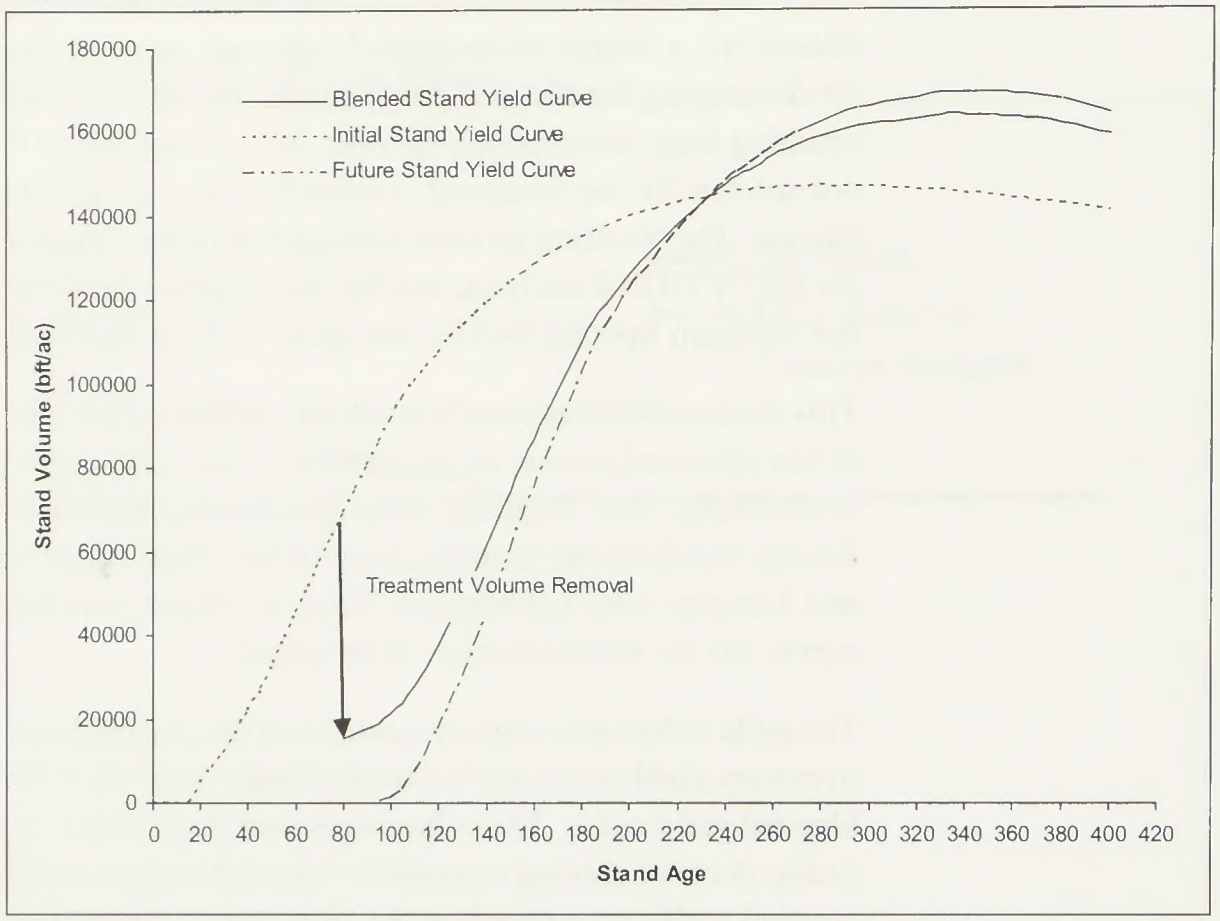
The table below provides an example of the pairing between the untreated overstory yield curve and the treated understory yield curve that results in a blended yield curve. The values represent the Current Vegetation Survey name prefix. A curve naming convention was established to identify the resulting blended yield curve based on the zone and treatment age. For example, the generation of the 1st intermediate harvest at age 120 for the Hemlock Zone would result in the following blended curves.

Table 308. Initial, regeneration and resulting blended yield curves.

Overstory Curve	Understory Curve	Blended Curve
MG1_1_NCM_NONE	NDF_NO_OS_1_PCT260	ALT3_H120_MG1_1_NDF
MG1_2_NCM_NONE	NDF_NO_OS_2_PCT260	ALT3_H120_MG1_2_NDF
MG1_3_NCM_NONE	NDF_NO_OS_3_PCT260	ALT3_H120_MG1_3_NDF
MG1_4_NCM_NONE	NDF_NO_OS_4_PCT260	ALT3_H120_MG1_4_NDF
MG1_5_NCM_NONE	NDF_NO_OS_5_PCT260	ALT3_H120_MG1_5_NDF

For example, if the intermediate harvest retained 40% of the original stand, the blended curve would include 40% of the stems from the original and 60% of the regenerated stand curve. The curves assigned to existing stands differed from curves assigned to recently regenerated areas to reflect current and/or future regenerations standards. In the model the treated stand retains the age of the overstory which represents the initial age of the blended curve. Figure 346 compares a stand's initial yield curve, the regeneration yield curve, the blended curve, and how a stand progresses from its initial curve to the blended curve. In the example below a stand receives an intermediate harvest at age 80. At the time of treatment, the stand supports a volume of approximately 70,000 board feet/acre. Immediately after treatment, the stand retains its age of 80, and has a residual volume of approximately 15,000 board feet/acre, or approximately 22% of the original stand volume. After treatment the stand is assigned to the blended yield curve and grows at the blended rate.

Figure 347. A comparison of an initial yield curve, the regenerated (future) yield curve and the blended curve.



Within the various landscape units multiple intermediate harvests were permitted, and for each possible intermediate harvest an additional blended yield curve was required. Blended curves were applied after intermediate harvest treatments. Where the blended curve of the first intermediate harvest was created from the initial curve combined with a regeneration curve, each successive treatment combined the previously blended curve with a regeneration curve. Once the landscape targets were achieved stands were regeneration harvested and then assigned to an unblended regeneration curve. The blended curves extended to a stand age of 400 years. In OPTIONS stand older than this were assigned the attributes of the 400 year old stand.

Alternative 3 Blended Curve Procedures

Create a blended curve for a stand within the Douglas-fir Zone (DF) with an intermediate harvest at age 80 years. This is the first intermediate harvest age and the green tree retention level is 19%.

Stand Summary Blending

1. Initialize the new blended yield curve with the stand characteristic from the overstory yield curve beginning at the blending age and continuing to the end of the projection horizon.



2. Incorporate the stand characteristics from the understory yield curve, matching the blended stand age with the initial understory age. In this example, the overstory stand characteristics at age 80 are matched with the stand characteristics of the understory at age 0.

3. Calculate the blended stand characteristics through the simple mathematical approach of summing the retention percent of the overstory stand and the remaining percent of the understory stand. In this example, 19% of the overstory stand is combined with 81% of the understory stand. This approach is applied to basal area, trees per acre and volume. Quadratic Mean Diameter (QMD) and height are re-set to the understory levels. Relative density (RD) is recalculated based on blended values for QMD and basal area.

Stand Table Blending:

1. Initialize the new blended stand table with the overstory stand table values for each species and diameter beginning at the blended stand age and continuing to the end of the projection horizon.

2. Incorporate the stand table values from the understory stand table by species and diameter, matching the blended stand age with the initial understory age. In the case where there is no matching understory species and diameter, incorporate these additional stand table values into to the blended stand table.

3. Calculate the blended stand table values through the simple mathematical approach of summing the retention percent of the overstory stand with the remaining percent of the understory stand. This approach is applied to basal area, live trees per acre, dead trees per acre and board foot volume and cubic foot volume. Height is re-set to the understory value.

In the case where there are only overstory stand values, the retention percent of the overstory stand values are used. In our example, 19% of the overstory stand values would be used.

OPTIONS Products

Introduction

The projection of forest conditions with OPTIONS is based in the model tracking the change over time for five basic attributes.

- Density – trees per acre
- Volume – board feet per acre
- Diameter
- Basal Area
- Height

The growth and yield curves coming from the ORGANON modeling can also be used as a source for forest attribute information since each OPTIONS polygon has a relationship with a growth curve.

Additional modeling was performed to create look up tables for the presence and absence of dead wood which could be related back to the OPTIONS projections.

Considering each alternative has between 4,000,000-600,000 GIS polygons, with 5 attributes, projected in annual increments for 200-400 years the potential data array from OPTIONS alone is considerable. Drawing data relationships from ORGANON or other models to derive forest attributes related to the OPTIONS projections increase that potential data to draw upon. Many of the outputs for the modeling required custom programming to extract and formulate the products for the ID team analysis.

Although OPTIONS performs it's projections in annual increments only key projection reporting periods (10, 20, 50, and 100 years) were established for the ID team analysis.

The following products from the OPTIONS modeling are described in this section.

- ASQ / NON ASQ Volume
- Ten Year Scenario
- Projections
  - Structural Stages Projection
  - Northern Spotted Owl Habitat Projection.
  - Age Projection
  - OPTIONS Projections – Technical Paper
- Economic Analysis Data
- Time Slice Report
- State of the Forest

- Net Down Report
- Attribute Data for GIS

ASQ / NON ASQ Volume

Harvest volumes are a direct output from the OPTIONS model. Volumes from OPTIONS for the plan revisions are based upon scribner16 foot short log volumes. Harvest volumes are based on the capabilities of the forest lands in each individual Sustained Yield Unit given the management action and allocations of the alternative. All volumes are rounded down to the nearest whole million board feet.

- ASQ Volume - ASQ is synonymous with the O&C Act term Annual Productive Capacity. For each alternative the non declining even flow volume that can be sustained from the harvest land base is the basis for the determining the Allowable Sale Quantity. Under Alternative 3 a two tiered volume was reported to account for the increased harvest level that can be attained after the landscape targets are met (regeneration harvest begins) and the owl and murrelet sites are released and increase the size of the harvest land base
- Non ASQ – Thinning harvest is simulated for the riparian reserves / management areas and for the late-successional reserves / management areas as they apply to the alternatives. The management actions for these allocations do not permit regeneration harvest and there are modeling age caps on the thinning treatments, thus a sustainable source of harvest cannot be expected from these lands. The OPTIONS modeling determined the amount of harvest volume that could be produced from these lands and step down levels as the stands age and their thinning treatment windows close.

The ASQ and Non ASQ volumes are recorded by SYU for each alternative, sub alternative and benchmark analysis in an Excel spreadsheet. The duration of the Non ASQ volume and the long term increase in ASQ for Alternative 3 is summarized as well.

Harvest estimates were modeled for the east side management lands in Klamath Falls only in the No Action Alternative since the silviculture treatments do not vary across the alternatives for those lands. No ASQ is declared for these lands since there are no O&C lands in that area.

Ten Year Scenario

The Ten Year Scenario selects polygon records that were harvested in the first ten years of the OPTIONS projections. For each polygon the acreage and volume harvested is reported by harvest type; regeneration, commercial thinning or selection. The OPTIONS Ten-Year Scenario report also identifies a random 1/3 sample of BLM sections that were harvested in the first decade and identifies all harvest units within those sections.

The OPTIONS output of the polygons harvested by harvest type with acreages and volume were brought back to GIS to make map products with these attributes. The Districts evaluated the harvest units in the sample sections to identify the logging system, and road construction needs.

Ten Year Scenario reports were produced for the No Action and all Action alternatives but not for the sub alternatives. An Access database was created with the first decade polygons harvested, with acreage and volume by harvest type at the SYU and District level. This data was linked to the vegetation polygons to make GIS coverages and map products.

Projections

Post processing of the OPTIONS data created a classification of every OPTIONS vegetation polygon record at year 0, 10, 20, 50, and 100 years for the structural stage classification, Northern Spotted Owl habitat classification and age class distributions. Databases were created for the No Action, Action alternatives, and the following sub alternatives / benchmark analysis; no harvest, no harvest of stands 80 years and older, no harvest of stands 200 years and older, add NSO critical habitat to the LSMA in alternative 1, short rotation, and maximum harvest. This data was linked to the vegetation polygons in GIS for further spatial analysis.

1) Structural Stage Projections

Richard Hardt (ID Team Ecologist) developed the criteria for the Structural Stage Classification used in the plan revision. There is a structural stage appendix further describing the criteria used in this classification.

1) Stand Establishment

- 1a.) Without Structural Legacies
- 1b.) With Structural Legacies

2) Young

- 2a.) Young High Density
  - 2a1.) Without Structural Legacies
  - 2a2.) With Structural Legacies
- 2b.) Young Low Density
  - 2b1.) Without Structural Legacies
  - 2b2.) With Structural Legacies

3) Mature

3a.) Single Canopy

3b.) Multiple Canopy

4) Structurally Complex

4a.) Existing Structurally Complex

4a1.) Existing Old Forest

4a2.) Existing Very Old Forest

4b.) Developed Structurally Complex

2) Northern Spotted Owl Habitat Projections

Chris Foster (ID Team Wildlife Biologist) developed the criteria for the Northern Spotted Owl Habitat Classification used in the plan revision (see table below). Three classes of habitat are determined based on diameter class, canopy cover, presence/ absence of snags (10 snags per hectare greater than 25 centimeters), presence / absence of down woody debris (greater than 2% ground cover).

Table 309. Northern Spotted Owl Habitat Projections

Diameter Class	Canopy Cover	Snag Presence / Absence	Down Woody Debris Presence / Absence	Habitat Code Version 4 - Finalized 10/18/06
Habitat values; 1 - non-habitat, 2 - dispersal, 3 - suitable and dispersal.				
11-20	0-40	a	a	1
11-20	0-40	p	a	1
11-20	0-40	a	p	1
11-20	0-40	p	p	1
0-11	0-100			1
20-30	0-40	a	a	1
20-30	0-40	p	a	1
20-30	0-40	a	a	1
20-30	0-40	p	a	1
20-30	0-40	a	p	1
20-30	0-40	p	p	1
20-30	0-40	a	p	1
20-30	0-40	p	p	1
30-100	0-40	a	a	1
30-100	0-40	p	a	1
30-100	0-40	a	a	1
30-100	0-40	p	a	1
30-100	0-40	a	p	1
30-100	0-40	p	p	1

Diameter Class	Canopy Cover	Snag Presence / Absence	Down Woody Debris Presence / Absence	Habitat Code Version 4 - Finalized 10/18/06
30-100	0-40	a	p	1
30-100	0-40	p	p	1
11-20	40-60	a	a	2
11-20	40-60	p	a	2
11-20	40-60	a	p	2
11-20	60-100	a	a	2
11-20	60-100	p	a	2
20-30	40-60	a	a	2
20-30	40-60	p	a	2
20-30	40-60	a	a	2
20-30	40-60	a	p	2
20-30	60-100	a	a	2
20-30	60-100	a	a	2
30-100	40-60	a	a	2
30-100	40-60	p	a	2
30-100	40-60	a	a	2
30-100	40-60	p	a	2
30-100	60-100	a	a	2
30-100	60-100	a	a	2
11-20	40-60	p	p	2
11-20	60-100	a	p	4
11-20	60-100	p	p	4
20-30	40-60	p	a	2
20-30	40-60	p	p	2
20-30	40-60	a	p	2
20-30	60-100	p	a	4
20-30	60-100	p	a	4
20-30	60-100	a	p	4
20-30	60-100	p	p	4
30-100	40-60	a	p	2
30-100	40-60	p	p	2
30-100	60-100	p	a	4
30-100	60-100	a	p	4
20-30	40-60	p	p	4
20-30	60-100	a	p	4
20-30	60-100	p	p	4
30-100	40-60	a	p	4
30-100	40-60	p	p	4
30-100	60-100	p	a	4
30-100	60-100	p	p	4
30-100	60-100	a	p	4
30-100	60-100	p	p	4

3) Age Class Projections

Starting age classes derived from the Forest Operations Inventory (see inventory data section of this appendix) increment forward on an annual basis with the OPTIONS projections until regeneration harvest treatments reset the age. The ages under Alternative 3 should be treated as broad age groups since the yield curves and the progression of stands over time reflect multi storied stand conditions in which age becomes somewhat of a fuzzy measure.

4) OPTIONS Projections – Technical Paper

Northern Spotted Owl Habitat and Structural Stage Classification

Stand Table Habitat and Structural Stage Classification Data

The NSO dispersal habitat and structural stage classifications are based on a number of stand averages and stand table statistics. Stand height is an example of stand average information, the number of stems greater than a threshold diameter, or the number of snags of a particular decay class, are examples of stand table information. OPTIONS utilizes and reports stand average data but does not provide the detailed stand table information required in the dispersal habitat and structural stage classifications. To project habitat and structural stage conditions throughout the planning horizon ORGANON stand tables were required.

In the modeling environment each WOPR unit may receive a number of possible treatment combinations throughout the planning horizon. The number of possible treatments varies by management regime (a series of treatments), species group, site productivity and alternative. The actual sequence of treatments a WOPR unit receives is a dynamic modeling process, dependent upon stand and landscape level targets and rules; it cannot be forecast outside of the OPTIONS model. However, it is possible to describe all possible combinations of treatments, and from this all inclusive set, select the actual scenario of treatments as reported by OPTIONS. Thus, an ORGANON stand table was created for each possible unique combination of treatment, species group and site productivity, for each management regime and for each alternative. A crosswalk table was defined to provide a reference between the treatment combinations and the corresponding stand table.

Modeling Process

There are a number of stand attributes to be considered in the habitat and structural stage classification for an individual WOPR unit, at a particular point in time. The ORGANON treatment stand tables were pre-processed, and then further analyzed to calculate specific habitat and structural stage statistics. These statistics, referred to as 'index values', are reference values in a look-up table; the Index Table. The index values for every modeling group, stand group, site index and treatment are stored in the Index Table.

One of the key steps in the pre-processing of the stand tables for northern spotted owl habitat classification was to generate index values for snags and down woody debris (DWD). The CWDM model was used to generate this information based on input from the stand table dead trees. Together, the stand tables, snag and DWD information provided the detailed information necessary to complete the habitat. Information from the CWDM is also reported within the Index Table.

The OPTIONS model records for each WOPR unit and for all years in the planning horizon, all silvicultural and harvest treatments performed. Also recorded are details of the treatments such as: the area treated, the type of treatment, the volume removed, as well as stand attribute information after treatment. Based on this information it is possible to compile a complete history of activities for each WOPR unit for the entire planning horizon.

Based on the information from the WOPR unit activity history provided by OPTIONS, the appropriate stand table reference is identified in the crosswalk table. This stand table reference is used to locate the index values in the Index table that will be evaluated to define the NSO dispersal habitat and structural stage classification.

Methodology

The following methodology was applied to generate the NSO Habitat and Structural Stage Index Report.

Source Information:

NSO Dispersal Habitat Classification

An NSO Dispersal Habitat definition table was provided that defines the stand conditions required to meet dispersal habitat. These included:

- Diameter Range– average stand diameter as from summary table
- Canopy Closure – based on relative density as follows
  Canopy Closure = -12.298 + 2.375(RD) – 0.014(RD)^2

- Snag presence: 10 snags/acre greater than 10"
- DWD presence: 2% ground cover. The percent ground cover was approximated using a conversion factor and volume by retention plant zones – Volume (cu ft/ac)/X var = % cover.

Retention Plant Zone	DWD Volume (ft3/ac)
p. pine/d. fir	362.648
SW ore conifer	465.179
Westside conifer	62.771

Note: TanOak and DF = SW Oregon, and W. hemlock = West side conifer
Note: Species Group of P. Pine for the p.pine/d.fir in SW Oregon

- Canopy (single/multi-story): A diameter diversity index (DDI) of 60 was used to determine the distinction between single and multi-story canopy, with single-story canopy having a DDI greater than 60 and multi-story canopy having a DDI less than or equal to 60.

Structural Stage Classification

Structural Stage Classification definitions were provided based on the following stand characteristics:

- Age: stand age from summary table
- Height: average stand height from summary table
- TPA: number of trees per acre by diameter from the stand table
- Relative Density: average stand relative density from the summary table
- Legacy Presence: the presence of legacy as an initial condition (based on MircoStorms structure stage classification) as well as the future creation of legacy based on alternative harvest prescriptions.
- CVgt(10): from summary table coefficient of variation of tree diameters greater than 10" dbh.

All Possible Treatment Yield Curve Crosswalk Table (ACT2CVS_XWALK)

This table identifies which treatment yield curve to use for the required stand characteristics and index values to determine the NSO Dispersal Habitat and Structural Stage Classifications. The treatment yield curve is identified based on the current alternative, management regime, species, site productivity class, and treatment age. Below is an example of the crosswalk table.

Index Value Lookup Table (INDX_LKUP)

This table is an Alternative based lookup table containing projected stand characteristics and index values for each treatment yield curve. Some of the index values available include:

- Stand characteristics: age, basal area, TPA, QMD, height, volume, crown ratio, canopy closure, relative density, SDI, CV, DDI,
- TPA by 10" diameter classes: # of trees in 0" to 9", 10" to 19", 20" to 29", 30" to 39", greater than or equal to 40"
- Snags by 10" diameter classes: # of snag in 0" to 10", 11" to 20", 21" to 30", 31" to 40", greater than 40"
- Snag TPA: # of snags greater than 10" dbh
- CWD by 10" diameter classes: sum of volume in 0" to 10", 11" to 20", 21" to 30", 31" to 40", greater than 40"
- CWD vpa: sum of volume greater than 10"
- Calculated canopy closure: canopy closure calculated based on relative density
- Overstory stand characteristics: available for Alternative 3 blended curves, based on the untreated yield curve (basal area, tpa, qmd, height, volume relative density, tpa by 10" diameter class, CV, DDI)
- Understory stand characteristics: available for Alliterative 3 blended curves, based on the treated yield curve (basal area, tpa, qmd, height, volume relative density, tpa by 10" diameter class, CV, DDI)

OPTIONS Run Files

To post-process an OPTIONS run, the following OPTIONS run files are required:

- OPTIONS data files (.DBF, .DBS, .SPG, .SIC)
- OPTIONS run files (.DEF, .DEV, .RUN, .I, .II., .V)

Procedure:

For each Alternative:

1. Using ORGANON, generate the possible treatment stand tables based on the Alternative's management regime definitions. Create the Crosswalk Table to identify which stand table to reference for a particular treatment combination.

2. Based on the Crosswalk Table, pre-process each treatment stand table to generate the index values that will be used to define the habitat and structural stage classifications. This includes projecting snag and CWD using stand table attributes. Create the Index Table to identify which index values to use for a particular treatment stand table.
3. Initialize a Habitat Report Table by listing for each WOPR unit the OPTIONS inventory values for forest type (forest, non-forest, road), initial management regime, species group, site productivity class and area.

For each forested WOPR unit in the Habitat Report Table.

4. Set initial conditions:
    - Initial Structural Stage and legacy (based on OPTIONS inventory structural stage)
    - Plant Series/Retention Zone (based on OPTIONS inventory)
    - NSO Variance: based on plant series, species group and habitat definition
    - Alternative 2 GTR (green tree retention) flag for MOCA and SHRUB areas
5. Based on the OPTIONS run results, build the WOPR unit Activity History Table including harvest activities and state of the forest years in chronological order. Also record the stand management regime, species group, site productivity and age at which these actives occur. This history table represents the changes in stand characteristics over time.

For each Activity in the Activity History:

6. Determine the current thinning treatment combination, partial harvest condition and legacy based on the type of activity completed.

    For Regeneration Harvest: reset thinning treatment combination, reset partial harvest conditions, re-evaluate legacy

    No Action Alternative (modeled tree retention), legacy is present (WL)

    Alternative 1 (no modeled tree retention), then legacy is not present (WOL)

    Alternative 2 (no modeled tree retention), then legacy is not present (WOL).

    Alternative 2 – MOCA and SHRUB area (modeled tree retention), then legacy is present (WL)

    Sub-Alternative 2 - Max Harvest (no modeled tree retention), then legacy is not present (WOL)

    Alternative 3 (modeled tree retention), legacy is present (WL)

For Selection Harvest: reset thinning treatment combination, set partial harvest condition, re-evaluate legacy

No Action Alternative, Alternative 1 and Alternative 2 there is no modeled selection harvest

Alternative 3 has modeled selection harvest, so legacy is present (WL)

For Commercial Thinning: set thinning treatment combination based on thinning age and thinning sequence, no change to partial harvest condition or legacy.

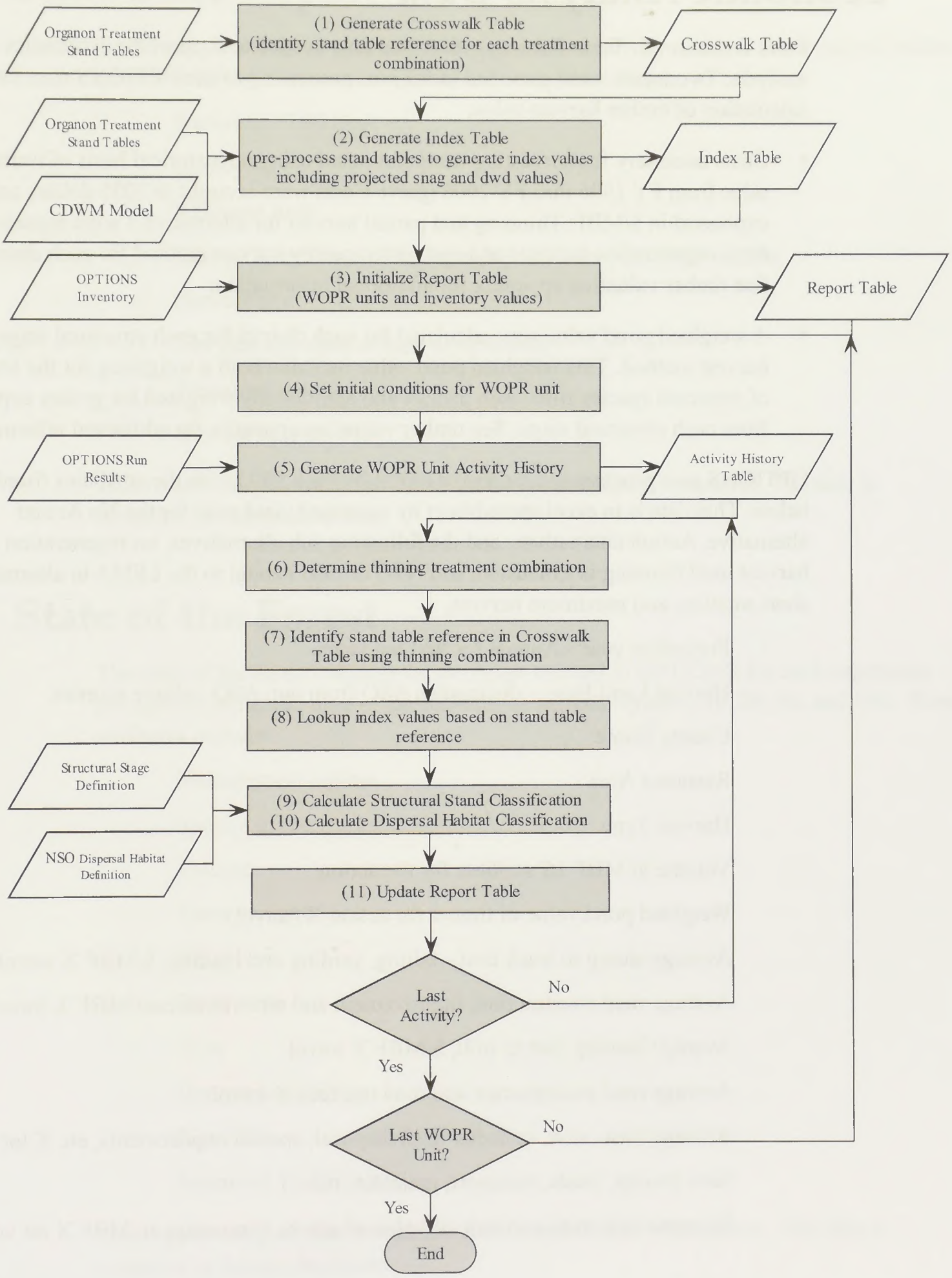
7. Set activity stand table reference from Crosswalk Table based on the treatment combination.
8. Retrieve stand characteristics and index values from Index Table based on stand table reference.
9. Calculate Structure Stage Classification based on index values and structural stage definition.

   For Alternative 3 with partial harvest conditions, if height is <50' Structural Stage is based on understory values. Otherwise Structural Stage is based on stand values.

   For Alternative 3 with partial harvest conditions, if Structural Stage is calculated as Mature-Single-Story, then canopy is reset to multi-story.
10. Calculate NSO Dispersal Habitat Classification based on index values and dispersal habitat definition.

    For Alternative 3 with partial harvest conditions, canopy is set to multi-story. Otherwise, canopy is set based on DDI values.
11. Update Report Table with Structural Stage and NSO Dispersal Habitat Classification values for reporting years

Figure 348. Data Flow Diagram for Owl Habitat and Structural Stage Classification.



Economic Analysis Data

Dave DeMoss (ID Team Forestry) identified data needed to support the economics analysis. Two inputs were provided to for post processing of the OPTIONS data for the calculation of timber harvest value.

- Costs necessary for harvesting were computed using an historical basis of timber sales from FY 1996 thru FY 2006 (part). Costs were brought to 2005 dollars and expressed in $/MBF. Thinning and partial harvest for alternative 3 were separated from regeneration harvests and costs averaged by harvest method for each district. See timber valuation appendix for additional information.

- A weighted pond value was calculated for each district for each structural stage and harvest method. This weighted pond value included both a weighting for the level of expected species from each district and additionally weighted for grades expected from each structural stage. See timber valuation appendix for additional information

OPTIONS post processing produced a report by each SYU with the attributes listed below. This data is in excel spreadsheet by sustained yield unit for the No Action alternative, Action alternatives, and the following sub alternatives; no regeneration harvest until thinning is exhausted, add NSO critical habitat to the LSMA in alternative 1, short rotation, and maximum harvest.

Projection year – Annual for first ten years.

Harvest Land Base – distinguish ASQ from non ASQ volume sources.

County Name

Resource Area

Harvest Type

Volume in MBF 16' scribner for the action

Weighted pond value of timber for action X (totvol)

Average stump to truck cost - falling, yarding and loading, $/MBF X totvol

Average road construction, improvement and renovation cost/MBF X totvol

Average hauling cost to mill, $/MBF X totvol

Average road maintenance and road usc fees X totvol

Average misc. cost, includes slash disposal, special requirements, etc X tot vol

Sum (stump, roads, transport, maintain, misc.)

Revenue-(tot cost), estimate of value of action, (Stumpage in MBF X tot vol)

Time Slice Report

For 10 year increments, spanning 200 years, this report summarizes the acres and volume harvested for the combination of data elements listed below.

Sustained Yield Unit

County

Resource Area

Harvest Land Base – Distinguish ASQ from Non ASQ volume

Harvest type

Ten year age class at time of treatment

Treatment area

Harvest volume

This report was generated for the No Action and Action Alternatives. The data is compiled in Access databases.

State of the Forest

The state of the forest contains the attributes tracked in OPTIONS for each vegetation polygon record at the time of the projections periods – year 0, 10, 20, 50, and 100. These attributes include

Management regime

Species group

Volume

Trees per acre

Height

Basal Area

Area

Harvest Land Base

Age Class

Sustained Yield Unit.

This report was generated for the No Action and Action Alternatives. The data is compiled in Access databases.

Netdown

The netdown report is produced in the data preparation for the OPTIONS data. Every OPTIONS vegetation polygon record is assessed against the GIS rules for the alternative. A matrix of all of the GIS layers / rules by each vegetation record is produced showing which layers constrain harvest. A hierarchy is established for each alternative to determine which allocations take precedence in assigning how a vegetation record is given a land use allocation code for modeling purposes. In general Non forest takes top precedence followed by the fixed allocations such as Congressionally Reserved, National Monument, and then the specific allocations of each alternative. The net down hierarchy is unique to each alternative. Below are examples from the No Action alternative.

Harvest Land Base coding is also assigned for each vegetation record to distinguish the forested areas from non forest, those lands available or not available for harvest, and those lands which harvest counts towards the ASQ. Below is an example of the coding for the No Action Alternative.

Y = Harvest is modeled and contributes to ASQ

N = No harvest is modeled

X = Non forest

P = Harvest is modeled but does not contribute to ASQ (LSRs).

S = Simulated future MAMU sites – No harvest is modeled.

NL = No Land Use Allocation data was available.

NT = No TPCC data was available

This report was generated for the No Action and Action Alternatives. The data is compiled in Access databases. This data was linked in GIS to create harvest Land Base and Land Use Allocation map products.

Table 310. Hierarchy of allocations

Hierarchy Order (constr. pri)	Allocation Code (constr. type)	Allocation Description
1	ROADS	Roads
2	NF	Non Forest
3	CGRR	Congressionally Withdrawn
4	MON	Monument
5	LSR	Late-Successional Reserves
6	AMR	Adaptive Management Area and LSR
7	KOAC	Known Owl Activity Centers
8	OMMS	Occupied Marbled Murrelet Sites
9	RPA	Reserve Pair Area Suitable Habitat and Next Best Reserved Categories
10	DDR	District Defined Reserves
11	NW	TPCC Non Suitable Woodlands
12	SW	TPCC Suitable Woodlands
13	AW	Other Admin Withdrawn, Rec Sites etc.
14	FOI	District OI based Outs - Seed Orchards etc.
15	RIP	Riparian Reserves
16	AMA	Adaptive Management Areas
17	CONN	Connectivity Diversity Blocks
18	GFMA	General Forest Management Areas
19	SGFMA	Southern GFMA
20	EML	East Side Management Lands
21	NL	No Land Use Allocation

Attribute Data for GIS

A GIS input file was created for each alternative. This spatial analysis dissected the vegetation polygons by all of the GIS layers which formed an allocation, modeling rule, or reporting unit needed for the OPTIONS modeling. The OPTIONS data prep program utilized this GIS file to further classify and format the data for OPTIONS modeling. Harvest Land Base coding is an example for this reclassification of the data. The data from the OPTIONS data preparation program is returned to GIS so selected attributes can then be linked and used for subsequent spatial analysis. This provides a common data set used in both the OPTIONS analysis and the resulting GIS spatial analysis. Access databases with the data going to the OPTIONS model and data returned to GIS were generated for the No Action and Action Alternatives.

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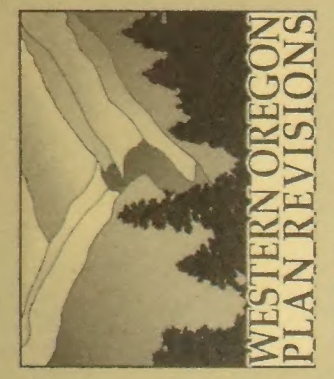
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